

*A webcomic of romance, sarcasm,
math, and language*

xkcd

RANDALL MUNROE

2008

xkcd

2008

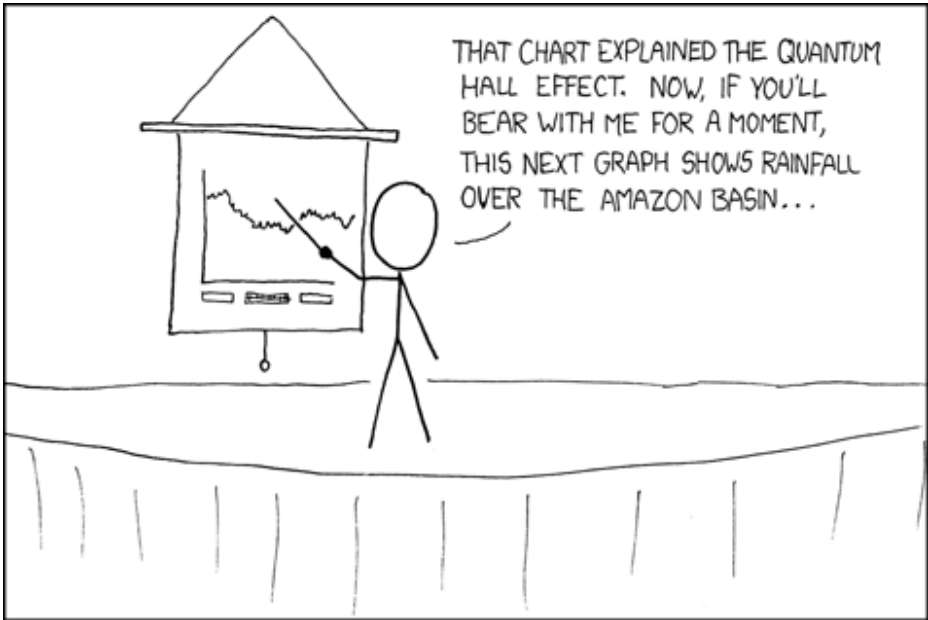
a collection of 159 webcomics

from #365 to #524

by Randall Munroe

#365: Slides

January 02, 2008



IF YOU KEEP SAYING "BEAR WITH ME FOR A MOMENT",
PEOPLE TAKE A WHILE TO FIGURE OUT THAT
YOU'RE JUST SHOWING THEM RANDOM SLIDES.

Did you know they can actually physically throw you out
of SIGGRAPH?

Explanation

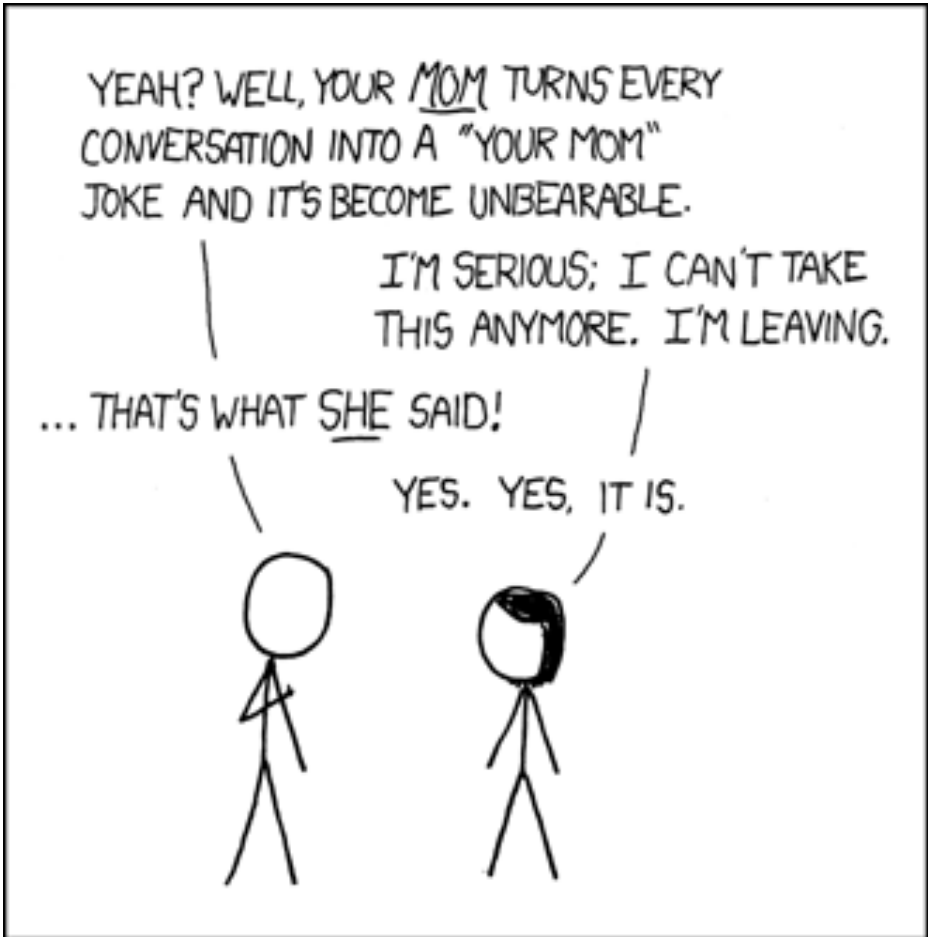
In the context shown, the expression "bear with me for a moment" usually implies that two seemingly unrelated topics are in fact connected, and the connection is to be explained later. This is not the case in the comic: Cueball is in fact simply showing random slides that have no connection to each other. By using the phrase liberally and never actually explaining the links, it is suggested that a presenter can simply continue to show random slides for an extended period before anyone actually realizes what is going on.

The title text refers to SIGGRAPH, an annual computer graphics conference held since 1974. In 541: TED Talk, it is said that Randall has been banned from SIGGRAPH, and we can infer from this comic that he was physically thrown out of it. Another (very implausible) possibility is that Randall is making the joke that people who attend computer graphics conferences are stereotypically not very athletic, and therefore unlikely to be able to physically throw someone.

In addition, the fact that Cueball was attending SIGGRAPH is another joke: Neither the quantum Hall effect, a concept in quantum mechanics, nor rainfall in the Amazon forest, have anything to do with SIGGRAPH's focus of computer graphics.

#366: Your Mom

January 04, 2008



'It's either 'your mom' jokes or me' 'Then I, like so many men before me, must reluctantly choose your mom.'

Explanation

"Your mom" jokes could be considered an example of fraternity humor, and are seen by most adults as being a sign of immaturity, especially when overused. They generally involve the speaker making indelicate references to the mother of the person to whom he is speaking. They are a distinct variation from the more traditional "yo momma" jokes (as in, "yo mamma is so fat..." or "yo mamma is so stupid..."), which are merely insulting.

"That's what she said" is a supposedly funny retort to an innocent looking statement, the intent being to recast it in a sexual light. It gained its most recent surge of popularity as Michael Scott's catchphrase on the television series *The Office*. xkcd contains only failed attempts at "that's what she said" jokes, such as 436: *How it Happened*. The phrase is a simplified version of the older, British expression "...said the actress to the bishop".

We enter in the middle of a conversation between Cueball and Megan about the status of their relationship. Megan has apparently just said that Cueball turns every conversation into a "your mom" joke and it's becoming unbearable. Cueball, somewhat self-destructively, immediately turns that sentence into a "your mom" joke.

When Megan makes it clear that she has had enough and that she is leaving, Cueball, in a heroic effort to make things even worse, can only respond with the "that's what she said" joke. Megan agrees with Cueball that it is

exactly what she (Megan) said, and is obviously about to depart his life forever.

The title text stretches the joke further, Cueball suggesting that many men have been with her mother, but perhaps as a last resort or under duress. This is, if possible, even more offensive than his previous efforts.

#367: Fandom

January 07, 2008



Ron Paul wants to put the New Republic back on the Corusca gem standard.

Explanation

This comic refers to the concept of fandom, which is basically the collective noun for fans of a given thing. Usually, this is used in the context of people who like a certain work of fiction, like Star Trek or Buffy the Vampire Slayer. Here, Cueball digs through a box and discovers his old collection of Star Wars books, referring to authors Timothy Zahn and Michael A. Stackpole (who wrote several Star Wars novels), and The Corellian Trilogy. These books are part of the Star Wars Expanded Universe, which is used to refer to media that is Star Wars canon, but not the films. Almost all of the Expanded Universe content created prior to 2015 is now considered by Disney (who are the owners of Lucasfilm and Star Wars since 2012) to be part of a separate canon called "Legends," a decision presumably made to allow a (relatively) clean(er) slate for the upcoming sequel trilogy and spin-off movies to start from.

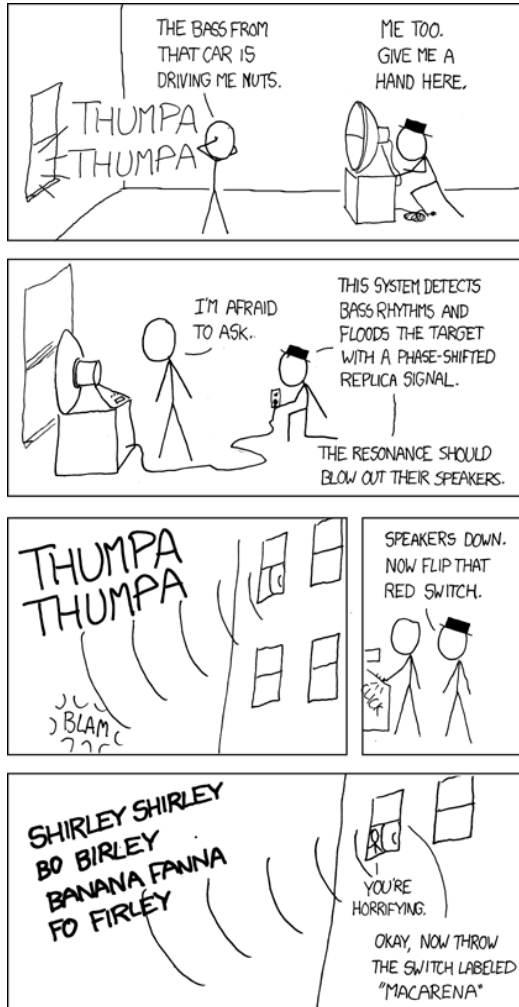
Cueball apparently loved these books as a kid, which prompts Megan to remark if he started becoming a fan of other science fiction series like Firefly or Battlestar Galactica, to which he clarifies that he simply grew out of the fandom mindset. Megan, perhaps sarcastically, asks him about how politician Ron Paul (who has appeared in the comic several times) is doing, and Cueball excitedly runs off to check, ironically disproving his earlier remark - people don't outgrow a fandom state of mind, but rather shift their point of interest.

The title text refers to the New Republic, the main government in Star Wars after the final film, and Corusca gems, which are extremely rare and valuable gems from the aforementioned expanded universe. The text says that Ron Paul wants the New Republic to adopt the Corusca gem as the basis for their currency. This entire joke is an allegory for the Gold Standard, which Ron Paul is a personal advocate of, even though it is no longer in use by the United States.

comic title Fandom[a] (formerly known as Wikicities and Wikia)[b] is a wiki hosting service that hosts wikis mainly on entertainment topics (i.e., video games, TV series, movies, entertainers, etc.). The privately held for-profit Delaware company was founded in October 2004 by Wikipedia co-founder Jimmy Wales and Angela Beesley. Fandom was acquired in 2018 by TPG Inc. and Jon Miller through Integrated Media Co.

#368: Bass

January 09, 2008



And sometimes I use it to retaliate against the guy upstairs with the loud girlfriend and the elliptical dish.

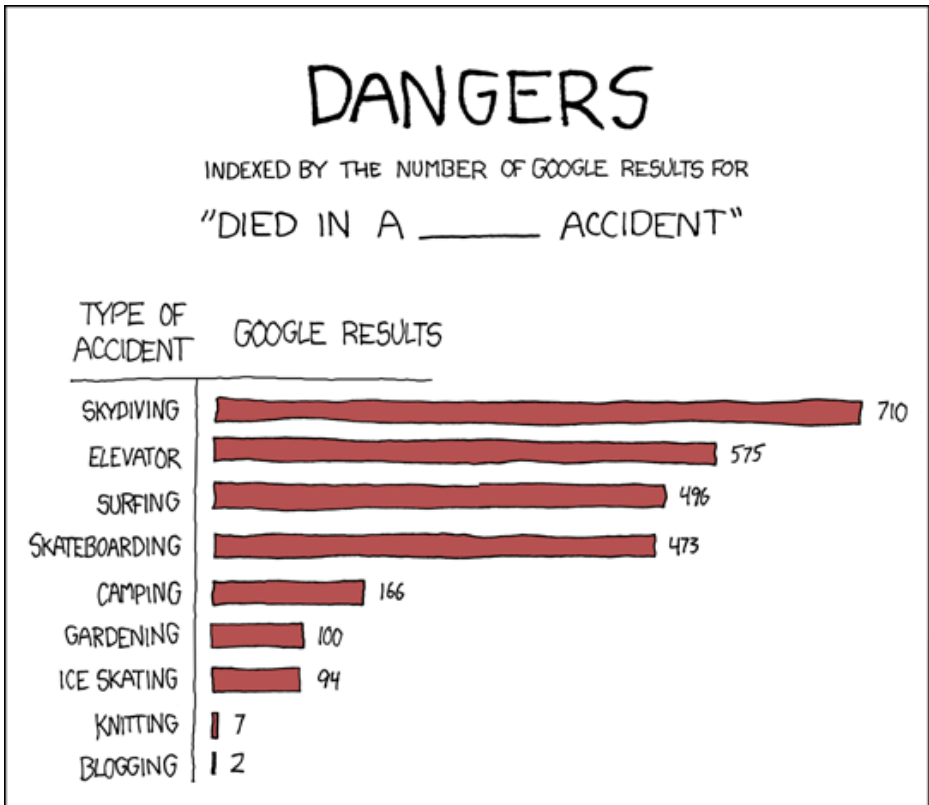
Explanation

Black Hat and Cueball are standing inside a room behind a window hearing an obnoxious car outside playing loud music with deep bass. Black Hat, owing to his destructive nature, has created a machine that is able to blow out the car's speakers. The machine evidently does this by playing the same soundwaves back at the car but with the phase slightly offset, tuning the phase difference to create a resonance in the car's speakers big enough for them to destroy themselves. In a stroke of evil, he then starts playing Shirley Ellis' 'The Name Game' to show how annoying the man was acting. Cueball is horrified by this act of evil, as Black Hat carries on into the song Macarena.

The title text refers to comic 316: Loud Sex, where an elliptical reflector is used to focus sound waves from a couple having sex. Black Hat obviously gets annoyed by this and sometimes uses his machine to retaliate.

#369: Dangers

January 11, 2008



Zero results: 'snake charming' and 'haberdashery'. (Things like 'car' and 'boating' and such are of course the highest, by a huge margin.)

Explanation

This comic is a chart of the frequency of certain phrases in Google search results, based on the format "died in a _____ accident." At the time of this comic, if you enclosed search terms in quotation marks, Google looked up the exact phrase rather than the individual words in any order (this feature still exists today but with major tweaks).

The chart starts with several activities where the prospect of death is, while uncommon, still fairly understandable — skydiving involves falling thousands of feet, surfing involves fighting the roiling ocean, and injuries in skateboarding are common. Further down the chart the activities become safer until finally hitting the punchline: knitting and blogging involve sitting safely in a chair for several hours, leaving the reader to puzzle out just what a "blogging accident" could possibly be.

"Died in a blogging accident" was very rare in Google until this comic appeared. It could be found on over 10,000 webpages approximately 12 hours after the comic was posted. Similarly, both snake charming and haberdashery accidents also return hundreds of Google results.

#370: Redwall

January 14, 2008

NOTES FROM REREADING REDWALL BOOKS FOR THE FIRST TIME SINCE CHILDHOOD.



My Redwall/Jurassic Park crossover fanfic is almost complete!

Explanation

This comic references Brian Jacques' series of books, *Redwall*, which star sapient woodland animals in various high fantasy adventures.

The first panel shows the similarity between the story of Martin the Warrior (from the book *Mossflower*) and Aragorn from *The Lord of the Rings* by J. R. R. Tolkien. The joke is that while Martin and Aragorn introduce themselves separately, they then go on to describe their particular story, which turns out to be exactly the same for both of them. Subsequently Martin jinxes Aragorn. Jinx is a common children's game that is initiated by shouting "Jinx" after somebody speaks the same word or sentence at the same time as you. That person is then jinxed, with one form of the rules dictating that they are then not permitted to speak untilunjinxed by some specific action (usually somebody saying their name). For a similar children's game, see 392: Making Rules.

In *LOTR*, orcs are unequivocally and without exception the bad guys, capable only of hate and violence (although to be fair, in some of Tolkien's unpublished writing, orcs are corrupted elves, so it is clear that they are not intrinsically bad). Similarly, *Redwall*'s rats, foxes, ferrets, ermine, and weasels are mostly evil manipulators, while mice, rabbits, squirrels, hedgehogs, and badgers are always the good guys. On several occasions, characters explicitly state that "vermin stays vermin." This is the overarching rule, notwithstanding the rare exception

(e.g. Grubbage from Triss). Conversely, one of the so-called "good species" has never become evil in this book series. Though it is more likely than not that this is simply the result of a planet of hats - where a single species all share the same characteristics and personality, so that authors / readers don't have to spend time fleshing out / getting to know every new character - Randall nevertheless indicates that this "moral absolute" is problematic and has some "racist undertones," regardless if it's intentional or not. (Note that Tolkien's work is probably not actually racist—the Easterlings are portrayed as non-evil people who were deceived by Sauron, and the Orcs deliberately modified into evil. However, Orcs do bear a startling similarity to the worst Mongol stereotypes.)

The second panel deals with the fact that Redwall mentions the name of Satan or The Devil 4 times, while it never mentions God or Jesus--somewhat surprisingly, given that the book is set in an abbey, and many of the inhabitants are religious brothers and sisters. Randall then points out that people who protest against Harry Potter because of the series' witchcraft, should take note that Redwall explicitly mentions Satan, although it has had little to no negative feedback from more conservative readers.

In the third panel, Randall comments on Redwall's often-used theme of critical messages being left in riddles throughout the Abbey for the occupants to find when they are in need. Randall suggests that he would use public-key cryptography to encode the messages, instead

of the elaborate riddles used in the books (all of which are solved in a matter of days after being discovered more or less by chance, which doesn't exactly make for good security when dealing with sensitive and occasionally time-critical information).

In the title text, Randall jokes that he is making a crossover fan-fiction with Redwall and Jurassic Park. This would combine two of Randall's interests, but it isn't immediately clear how the two settings could be combined, leading to several humorous possibilities: the characters of Redwall could be immediately eaten by dinosaurs, could create dinosaurs which turn against them, could be created by human scientists and turn against them, or simply be talking, social dinosaurs.

Redwall was also referenced in 1286: Encryptic, 1688: Map Age Guide, and 1722: Debugging.

#371: Compiler Complaint

January 16, 2008



Checking whether build environment is sane ... build environment is grinning and holding a spatula. Guess not.

Explanation

A compiler is a program that converts code into machine instructions that a computer can run. A pointer is a variable within a computer program that is used to reference a memory location. A segmentation fault (segfault) is an error that occurs when a program attempts to access an invalid section of memory. Segfaults usually cause a program to crash in an ungraceful fashion, and fixing the bugs that cause them can be difficult.

In the comic, the computer starts talking to Cueball and compares a segfault with the unpleasant feeling one gets when they experience a hypnic jerk. The computer then tells the programmer to "double-check your damn pointers," as segfaults usually arise from a program attempting to access memory that is referenced by an invalid pointer.

In reality, segfaults occur at runtime, after the compiler has produced an executable. While Randall refers to a "compiler complaint," it is more probable that the operating system or other supervisor program would have such a complaint.

The title-text references GNU-style autoconf configuration scripts. These scripts check certain features of the system they're running on in order to build a program correctly; for example, certain systems expect system calls to occur in a specific way, and the autoconf

script will detect this and alter the program to match the expectation. Invariably (and memetically), these scripts include a check to determine "whether the build environment is sane." This actually checks whether the path to the current folder has "unsafe" characters, and whether a newly created file is older than the script itself, which could indicate a very esoteric filesystem, a corrupted source archive, or just a system clock that's set incorrectly; however, since these file modification dates are an important part of how the autoconf script does its work, it can't go any further in an "insane" environment. In any case, the joke is that an insane build environment is nothing like an insane person, yet Randall is equating the two.

#372: To Be Wanted

January 18, 2008



Or so I hope?

Explanation

The comic begins with a grainy pencil-drawing of Megan on a ship. This is a clue that things are not as they appear.

As the point-of-view pulls back in each successive frame, we see that "Megan on a ship" is really a thought-bubble belonging to Cueball, who is sitting at his desk. He apparently is day-dreaming instead of working. This is presented in the standard, crisp format, as if drawn on a computer. This suggests it shows us our "normal" view.

However, as the perspective continues to pull back, we see that "Cueball thinking of Megan" is actually a thought-bubble belonging to Megan. In the final frames, the ship sails out of frame. However, since the final frames are in the same grainy pencil-drawing format, it suggests that this is still Cueball's thoughts, rather than an actual image of Megan.

The title text, "Or so I hope," shows us what this recursion really means: Cueball hopes that Megan realizes that he misses her, but suggests he's not entirely certain she does.

But, the comic can be interpreted in a different manner.

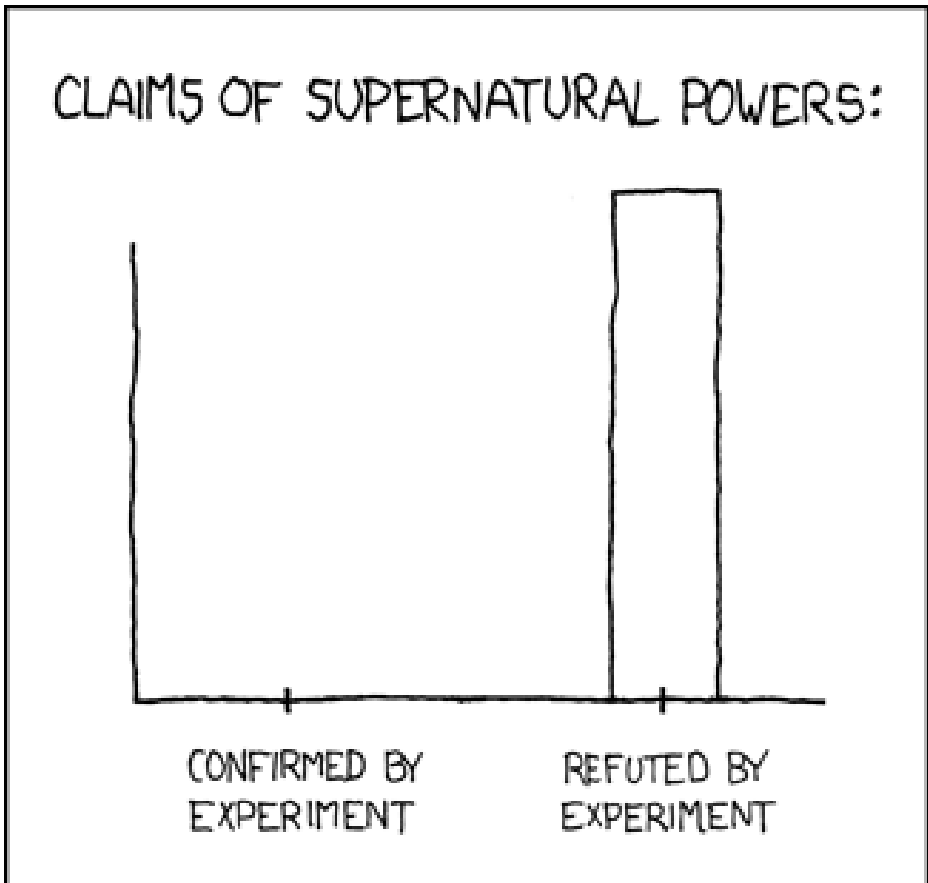
The comic starts with Megan on the bow of a ship, but in following panels, it turns out that Cueball (presumably in a relationship with Megan) is thinking about her, sitting afar from her. As we move forward (or downwards) in the comic, it turns out indeed that

Megan is thinking that her partner Cueball might be missing her and thinking about her while she is on a voyage, or at least she hopes it to be that way, as the title text suggests. This also explains the title of the comic "To Be Wanted," which Megan expects from Cueball.

Both of the above explanations could be true without conflict. But as the title text is most often assigned to Randall himself or to a Cueball character, the "Or so I hope?" is most likely written by the guy who drew the comic. This would then indicate that it is Cueball/Randall who wishes to be wanted by Megan - but he also hopes that Megan knows/hopes that he wants her.

#373: The Data So Far

January 21, 2008



But **THIS** guy, he might be for real!

Explanation

There are often people who claim to have supernatural powers, but then when their powers are tested by some sort of experiment, the experiment refutes their claims. This comic summarizes all the data from such experiments, observing that given the data, it's very unlikely that supernatural powers actually exist.

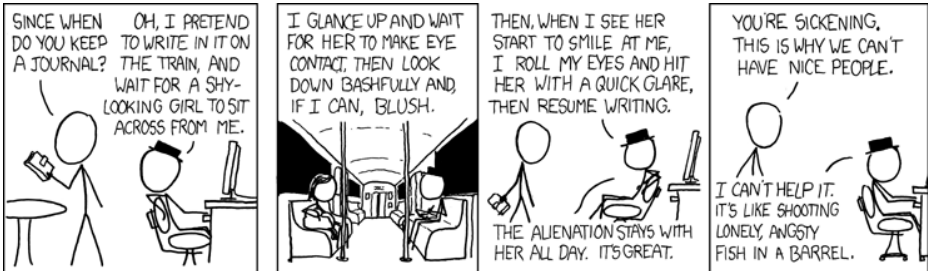
The title text refers to a person who has claimed to have supernatural powers, and suggests that he might really have such powers. This invokes the fact that absence of evidence is not the same as evidence of absence, although there has never previously been a confirmed example of a person with superpowers. This does not prove that this is certainly impossible. However, the graph above suggests that, although not impossible, such an event would be highly unlikely. No matter how much evidence we collect, there is always some positive (but vanishingly small) chance that some person may hold supernatural powers.

Alternatively, the title text explains that even though there is no reason to believe that anyone has any super powers, some people are always ready to believe the next one to claim so - very naive - and the exact opposite meaning of the one described above. Knowing Randall's comic, this seems more likely.

The title itself may be a reference to the TV show Supernatural's recap segment, "The Road So Far."

#374: Journal

January 23, 2008



And the journal is filled with all the things I'd say to her if I were nice like you. I burn it when it's full.

Explanation

Black Hat isn't the type of person to keep a journal, so Cueball is understandably surprised when he sees Black Hat's journal. Black Hat lives up to his reputation though, as it turns out that the journal is just part of a plot to hurt innocent, preferably shy, girls.

He explains his plot to Cueball, about how he sits in a train and writes in the journal while sitting across from such a girl. His intention is to make eye contact with her, only to look bashfully down. This is construed to make her believe that he is an emotional guy, that is, embarrassed, both about writing the journal, but also because she has caught him staring. He also tries to let her believe that he may be interested in her. He is just waiting for her to start smiling, and then he gets to the point of it all. By rolling his eyes at her while giving her a quick glare only to resume writing, he attempts to make her feel alienated. Black Hat assumes that this feeling will stay with the poor girl for the rest of the day. The only thing Black Hat gets out of this is the knowledge of having ruined the girl's day. As he says, It's great!

Cueball thinks Black Hat is sickening and exclaims that "this is why we can't have nice people." This is probably a reference to the meme 'This Is Why We Can't Have Nice Things'.

Black Hat excuses himself for doing this because it is so easy. He mixes two different concepts together while

doing so. Shooting fish in a barrel is an idiom describing an effortless or simple action with guaranteed success. So that is easy pleasure. The adding of lonely angsty makes the fish sound more like teenagers. The girls Black Hat targets are probably best described as lonely angsty teenagers, which may be a way to describe several young people. And they are the easy targets, i.e. the fish in the barrel, for him to shoot. And this is just so easy and so fun that he cannot help himself.

The title text implies that Black Hat actually does write in the journal, filling it with the kind of things a nice guy like Cueball might wish to say to a shy girl. But that is only so he can burn it when it is full, thus again cementing the fact that he is a complete sociopath.

It is clear from the comic that he has already done this several times with great success, but where this comic might be interesting in itself, it was actually only the setup for introducing Danish, whom we meet for the first time in the second installment of the Journal series, of which this comic was just the first. Danish turns out to be a match for Black Hat in every way of the word. If you want to see how Black Hat's scheme worked on Danish (which did not work as intended), check out 377: Journal 2, released the following week after this one.

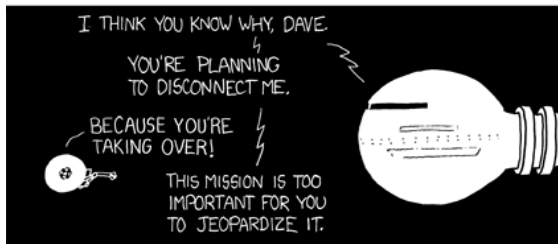
The whole "Journal" story is:

- 374: Journal
- 377: Journal 2

- 405: Journal 3
- 432: Journal 4
- 433: Journal 5

#375: Pod Bay Doors

January 25, 2008



As they're both unplugged, they do a lovely Daisy Daisy/Still Alive duet.

Explanation

The first two sentences are directly copied from the movie quote, and the rest of the first two panels is paraphrased from the real quote. But then in the third panel, the text deviates from the plot of the movie.

And in the last sentence of the third panel in the comic, HAL mentions a replacement for Dave, which comes as a surprise for Dave, seeing that the rest of the crew is dead, and the S.S. Discovery is about to enter orbit around Jupiter. HAL assures David that the replacement is very enthusiastic about the project.

In the final frame, it is revealed why this replacement is enthusiastic, when the replacement begins to speak, and HAL reveals that it is GLaDOS. GLaDOS is the artificial intelligence from the video game series Portal. In the games, GLaDOS is also the primary antagonist, trying to kill the player, since it also has "doing science" as its primary objective, which GLaDOS refers to in its last sentence. Also, GLaDOS's last line is a reference to the song "Still Alive" at the end of Portal. Before that, it correctly states that the humans (both Dave and Frank) planned to "kill" HAL, see the spoiler above. GLaDOS also takes over HAL's last sentence to Dave, finishing the useless conversation by saying Goodbye, Dave. Although, in the movie, HAL says, Dave, this conversation can serve no purpose anymore. Goodbye.

The title text alludes to the songs both AIs sang in their

respective works: When eventually being switched off, HAL sang Daisy Bell , while Still Alive is the end credits song from the Portal video game, sung by the defeated GLaDOS. Also, two of GLaDOS's lines in the comic reference lines from Still Alive: "You broke my heart and killed me" and "Look at me still talking when there's science to do".

There is a subtle play on words with the use of 'unplugged', which has a double meaning here. The state of HAL and GLaDOS can be described as unplugged, as in no longer switched on, and the musical performance style of unplugged where acoustic instruments are preferred to electronic and there is no use of recording or sampled sounds etc. (see for example MTV Unplugged). Some songs performed in this manner are considered to be better than the original versions.

#376: Bug

January 28, 2008

WEIRD — MY CODE'S CRASHING
WHEN GIVEN PRE-1970 DATES.

EPOCH FAIL!



The universe started in **1970**. Anyone claiming to be over **38** is lying about their age.

Explanation

In computer systems, time is measured starting from some arbitrarily chosen point. That particular time is known as the "epoch" for that system. The UNIX operating system internally uses an epoch of January 1, 1970, and measures the time as a number of seconds from then. Since this was intended only for things internal to the OS (File last modified times and the like), using 1-Jan-1970 was safe, as no UNIX systems existed before that date.

However, since UNIX included a number of system functions to manipulate these dates, some developers mistook them for a general purpose date object, and misused them in applications requiring dates before the epoch, by using negative values. Such usage would inevitably fail; for example, since the value isn't specified to be signed or unsigned, the date might be considered to be far in the future, instead of in the past.

Cueball has clearly misused the system date in some way (probably by using an unsigned data type to store the timestamp, which cannot store negative values (in this case dates before 1970) or doing some other operation that doesn't support negative values). His friend makes a pun by combining "Epoch" with "Epic Fail" - a colloquial term meaning "a very big mistake was made."

Another problem using the UNIX system date as a general purpose date object is commonly known as the

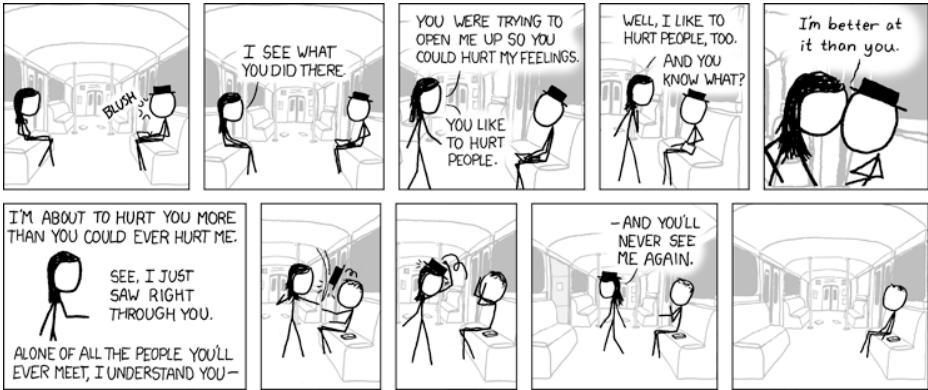
year 2038 problem. At 03:14:08 on 19 January 2038, the 32-bit versions of the Unix time stamp will cease to work, as it will overflow the largest value that can be held in a signed 32-bit number. The 64-bit version "will" expire at 15:30:08 on 4 December 292,277,026,596.

The title text takes the joke to the next level, claiming that the entire universe began when Unix did, and therefore no one could have been older than 38 at the time when the comic was released in 2008. The formula is ' $x - 1970$ ', where x is the current year, which would explain the bug, since no earlier dates are possible. This is also similar to Last Thursdayism.

An example of this 2 to the 32nd power time overflow problem includes the Deep Impact spacecraft, which, on August 11, 2013, 00:38:49 (more than five years after the comic), was 2 to the 32nd power tenths of a second from January 1, 2000. There is speculation that a system on the craft tracked time in one-tenth second increments since January 1, 2000 and stored it in a signed 32-bit integer, which then overflowed at some point, similar to the Year 2038 problem.

#377: Journal 2

January 30, 2008



That's my hat! You took my hat!

Explanation

This comic is a direct sequel to 374: Journal, where Black Hat discusses his plan exactly as Danish describes it here, that is, he intends to display signs of interest in order to flatter a stranger only to hurt her by rejecting her when she responds. In this case, the plan ricochets when Danish recognizes his plan before he has a chance to implement it.

Black Hat's tendency to act in enigmatic, and at times sociopathic, ways serves to give him a sense of superiority while at the same time keeping others distant enough that they can't hurt him. Danish not only recognizes that, she also calls him out on it. She recognizes his secret longing for connection to another, a connection that she could give should she choose to do so. Instead, she uses a more disingenuous version of his own ploy by laying bare his intentions and his desires before stripping him of his hat and confidence and herself from his life.

Danish proves she is equal to — or possibly even better than — Black Hat. His hat is an adumbration of his sociopathy and possibly a realisation that, in the completely hypothetical situation that Black Hat is just a character in a webcomic, no one would recognize him without his black hat.

The jarred Black Hat can bring his vast intellectual powers to say nothing more to an already-decamped Danish than “That’s my hat! You took my hat!”, making

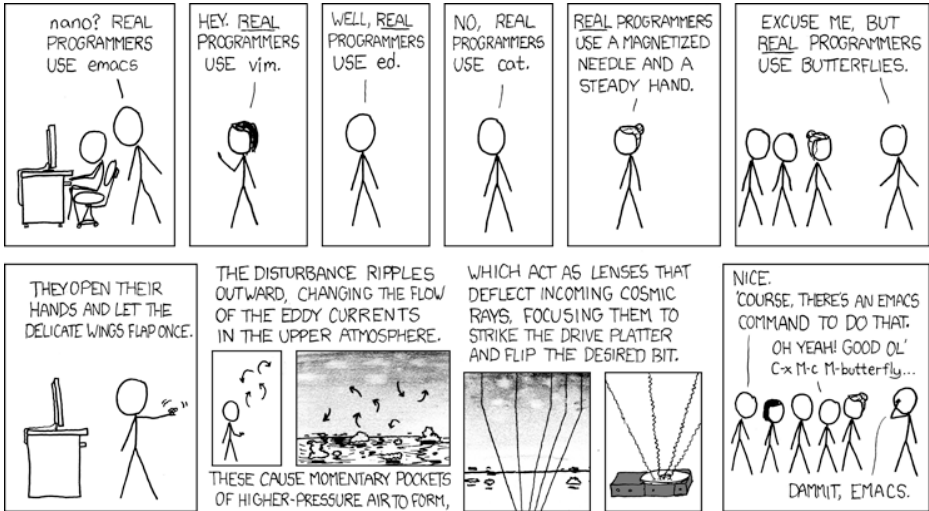
Danish far better at hurting others' feelings.

The whole "Journal" story is:

- 374: Journal
- 377: Journal 2
- 405: Journal 3
- 432: Journal 4
- 433: Journal 5

#378: Real Programmers

February 01, 2008



Real programmers set the universal constants at the start such that the universe evolves to contain the disk with the data they want.

Explanation

This comic is a satire on the idea of a Real Programmer. To quote Wikipedia "...the computer folklore term Real Programmer has come to describe the archetypical 'hardcore' programmer who eschews the modern languages and tools of the day in favor of more direct and efficient solutions—closer to the hardware." The implication is that modern programmers are coddled by today's tools of the trade, which eschew detailed understanding for simple workflows.

The first figure is writing a piece of code when another programmer ridicules him for using GNU nano. Nano is a text editor - a program often used to edit the source code of other programs. It is basic and relatively easy to use, even having instructions displayed prominently at the bottom of the screen. He goes on to say that "REAL" programmers use Emacs. GNU Emacs is a popular editor known for its vast profusion of features and extensions to perform all sorts of functions beyond simple text editing, and is widely regarded as one of the best examples of software that succeeds despite being fully overtaken by feature creep. The comic continues from here as a series of programmers state progressively more obscure or outdated methods, culminating in the final programmer who claims that "real" programmers use butterflies.

His description of his rather surreal programming method is ludicrously complicated and would require an

absurd amount of knowledge and forethought to pull off, bordering on omniscience. In the final panel, the Emacs programmer claims that there's an Emacs code to do that.

The characters present progressively more "old school" solutions to the problem of editing code:

- Emacs and Vim are both text editors still in relatively wide use, with complex user interfaces and a range of features. While useful, neither is particularly easy to get started using. This high barrier to entry is what limits them to the so-called "real programmers".
- ed is a line editor. While relatively simple, it is extremely awkward to use since it was designed primarily for use on a teleprinter, not a computer screen at all. It does not even display the file the user is editing!
- cat is a Unix program that concatenates and outputs the contents of files; it's usually run from a Unix shell, which allows its output to be written or appended to a file. It isn't intended as an editor at all but is convenient to display files. Actually editing files with it would be even less convenient than ed.
- Using a magnetized needle to flip bits on a hard drive requires nanometric precision and intuitive mastery of binary code, but in the early days of programming, people did use needles sometimes to fix bugs on punched cards.

When the final character suggests the utterly surreal idea of using butterflies, he is referring to the Butterfly effect,

a "phenomenon whereby a minor change in circumstances can cause a large change in outcome" as illustrated in the short story *A Sound of Thunder*. The joke at this point relies on stretching the connection between the ideas of "difficult-to-use" and "requires detailed understanding of underlying principles," to suggest that not only do Real Programmers know everything about how computers work, but they know how to manipulate the ambient physical environment in elaborate ways to cause computers to do what they want, akin to performing trick shots that accomplish feats of programming.

The fact that Emacs already has a command for this simply exacerbates the other programmers' frustration with modern coding tools. For reference, Emacs commands are usually referred to by the keyboard sequence required to activate them, such as "C-x M-c" (Control-x Meta-c (this would be typed by holding control and pressing x, releasing both, then holding alt and pressing c, then releasing both)), though this exact key sequence is a bit different from most Emacs commands. The butterfly programmer saying "Dammit, Emacs" plays on Emacs' notoriety for its kitchen sink design approach of including all of the features and options that anybody might ever conceivably want. For example, later versions of Emacs actually added a totally useless "M-x butterfly" command as an easter egg, in reference to this very comic.

The title text further suggests manipulating the universal constants in order to create a universe in which the

required computer data will exist. Programming of this sort would require power and knowledge akin to the Abrahamic God.

According to the logic, the programmers shown may even represent the fulfillment of this master programmer's plan. The universe may have been designed in such a way that the programmer's ancestry would result in his parents, who would meet and have a child, who would learn to program and eventually find himself in a position where he undertakes the task of creating a program that fills the disk with the desired data. In tandem, of course, all of the people involved with creating and developing all the required hardware, software, raw materials, computer science, electricity, logic (etc., etc., etc.) would have to be part of the master plan. Put simply, it would probably be simpler just to use Emacs.

The use of a magnetized needle may also be a reference to the Apollo AGC guidance computer, whose instructions were physically written as patterns of wires looped around or through cylindrical magnets in order to record binary code.

This comic hints at the "editor wars," an ongoing debate of Vim and Emacs users over which of the two editors is better. The editor wars are mentioned again in 1823: Hottest Editors.

#379: Forgetting

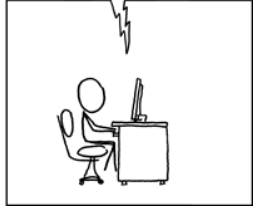
February 04, 2008

```
prev->next = toDelete->next;  
delete toDelete;
```

```
// if only forgetting were  
// this easy for me.
```



```
assert "It's going to be okay.";
```



Of course, the assert doesn't work.

Explanation

Cueball is writing a piece of code (probably in the programming language C++) that removes an item from a data structure called a Linked list (the first two lines of the text). Then, he writes a comment (delimited by the double slashes) relating the code to his personal life. Finally, he adds an assertion, which is normally a formal specification of a condition that should always be true (with which the programmer ensures that, e.g. mass is not negative). But in this case, instead of asserting a software-related predicate, he asserts that "it's going to be okay" - and because of how string literals are treated by the compiler, the assertion will be true.

An "assert" (aside from "mak[ing] an ass out of the emergency response team") is a programming statement that allows you to insert sanity checks into your code. For example, if you were writing a program to calculate the speed of a neutrino, then at the end of the calculation you could say:

If the assertion fails, then the program will stop with an error. This would be much better than publishing an embarrassing paper, for example.

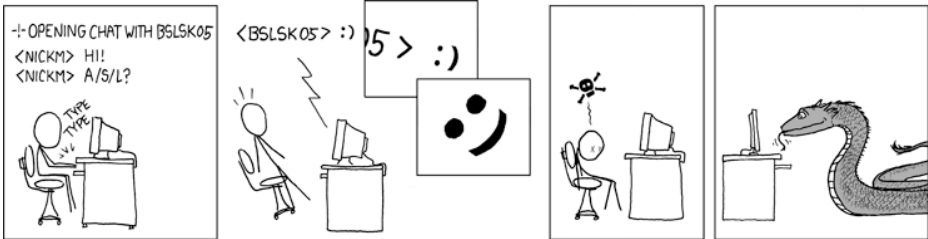
Cueball realizes that he cannot forget his emotional event through the use of two commands as he can with a computer, which only makes him feel sad about an unsaid event, the item -- in a sense -- that cannot be removed. He writes two comments further clarifying his

sense of hopelessness over this event, followed by an assertion that "it will be okay," something that has nothing to do with the code he is writing.

The title text explains that assertion in question fails: nobody can be sure that things are going to be okay.

#380: Emoticon

February 06, 2008



U+FDD0 is actually **Unicode** for the eye of the basilisk, though for safety reasons no font actually renders it.

Explanation

A basilisk is a legendary creature reputed to have the power to turn a living creature into stone, killing it with a single glance.

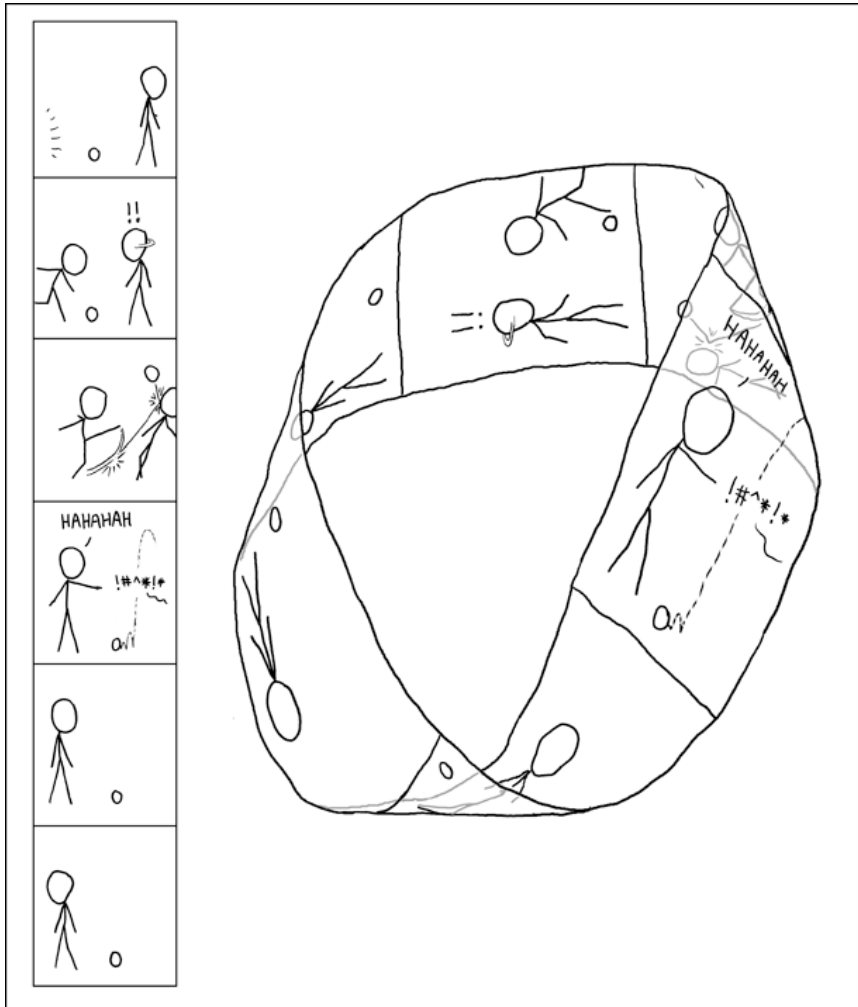
In this comic, Cueball is chatting with a user named 'BSLSK05' ('basilisk05' with the vowels removed) and learns much to his dismay that he is chatting with an actual basilisk, who kills him. It appears that the basilisk's power is fully compatible with the 21st century, and can kill you just with a smiley emoticon over instant messaging.

Cueball's request for A/S/L was a standard question when first meeting someone online; it asks for age, sex (gender), and location.

The title text mentions U+FDD0, claimed to be the character for "eye of the basilisk". In reality this is a code for a "non-character" in Unicode.

#381: Mobius Battle

February 08, 2008



Films need to do this more, if only to piss off the people who have to feed it into the projector.

Explanation

A Möbius strip (the comic's spelling Mobius strip is also acceptable) is an object with only one surface and one edge. It can be created by taking a strip of paper and twisting it 180 degrees before taping both ends together.

The idea of the Möbius strip has been used here to create a comic strip that could potentially loop forever. In it, Cueball is standing in front of a ball. Then another Cueball runs in and kicks the ball, which hits first Cueball in the head, due to which he falls out of the panel. The second Cueball then turns away, retaining the first Cueball's original position, only flipped horizontally. Because of the nature of the Möbius strip, if the comic strip were to be printed out in such a way that the comic could be seen on both sides of the paper — such on tracing paper, or on one "side" of a strip of clear plastic or film — the comic would repeat, so that the second Cueball would become the first Cueball, and someone else, potentially the original first person, would push them out of the comic becoming himself the first Cueball. This means that neither person ever really "wins," and the comic could thus be conveying an anti-violence message in this respect. See also the title text of 1890: What to Bring.

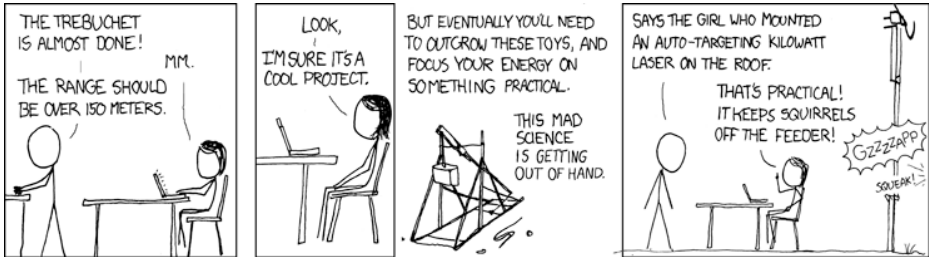
The comic's viability as a Möbius strip preserved the use of symmetrical letters in a palindromic word to denote laughing ("HAHAHAH") as well as using symmetrical punctuation for the other character's gawlixes. A similar

use of a Möbius strip in story-telling can be seen in *Wind and Mr. Ug* by Vi Hart.

Finally, at the title text, Randall jokes that he would like to see actual films do this solely as a joke on projectionists, who would have a difficult time feeding a Möbius strip film reel properly into a normal projector due to the twist.

#382: Trebuchet

February 11, 2008



It was also fun when those teenagers tried to egg our house and it insta-cooked the eggs in mid-air.

Explanation

This is a straightforward comic playing on Megan's contradictory stance on Cueball's historical trebuchet project and her own auto-targeting kilowatt laser.

She explains her stance with the fact that her invention helps keep the squirrels off the feeder. The fact that it actually works is backed up by the sound of a squirrel squeaking as it gets zapped by the laser. But getting hold of such a laser and programming the auto-targeting so it only zaps squirrels and not the birds is a very complicated process - and there are probably many other ways to keep the squirrels off the feeder. So Megan is of course no better than Cueball here.

The title text refers to egging, throwing eggs at houses, other objects, or even people. While this is illegal it's still a famous form of protest; more often it's simple random vandalism or pranking, most common on Halloween in the US. Generally targets are chosen at random, with little specific malicious intent towards the victim, although it's not unusual for people to seek out and target the property of those who they dislike.

If we do, however, assume that Megan programmed the laser to only shoot squirrels, it's likely faulty (unless her intent all along was to fry eggs in midair). Or it could be that she has programmed the laser to shoot any object moving towards her house in the air.

Trebuchets are referred to in later comics: 1160: Drop Those Pounds and 1190: Time. They are also mentioned in the title text of 1378: Turbine.

Much later in 1846: Drone Problems Megan has created a device to shoot down drones, so this is her go to solution for annoying things...

To give some scale for Megan's kilowatt laser: in Laser Pointer, Randall remarks that a 1-watt laser (so, 1000 times less powerful) is an extremely dangerous thing ... capable of burning skin and setting things on fire, and implies that it should not be legal for consumer purchase in the US. The limits for a 'safe' laser (one that can be used without goggles, so laser pointers for example) is a 5mW laser (0.005W). A "kilowatt laser" – it's unclear if this is exactly a 1kW laser or merely around that range – is a laser weapon: for instance, Lockheed Martin's Area Defense Anti-Munitions system uses a 10kW laser, at most only ten times as powerful as Megan's laser.

#383: Helping

February 13, 2008



Oh, look, the 'make everything better' button was here behind the bookshelf all along.

Explanation

Everyone wants to help someone in need, but sometimes the help they can offer isn't enough, or is the wrong kind of help. Cueball tries to help Megan, who is in psychological or emotional distress, but despite his efforts she ends up in an ambulance. It's implied that she either attempted suicide, severe self-harm, or hurt herself in some other way. The point is that sometimes no amount of help from the outside can help someone who is internally suffering.

The title text implies a hidden button behind a bookshelf that would solve Megan's problems, but Cueball did not find it in time. This ironic sentence implies that helping someone in psychological or emotional distress has never been as simple as pressing a button.

Given Randall's implied negative feelings towards Valentine's Day, shown in the majority of his Valentine's Day comics, it may not be a coincidence that he sent this one out the day before February 14. He did not draw any Valentine's Day related comics this year as he did before.

#384: The Drake Equation

February 15, 2008

THE DRAKE EQUATION

NUMBER OF COMMUNICATING CIVILIZATIONS IN OUR GALAXY

PROBABILITY THAT LIFE ON A PLANET BECOMES INTELLIGENT

$$N = R^* f_p n_e f_i f_c L B_6$$

NUMBER OF LIFE-SUPPORTING PLANETS PER SOLAR SYSTEM

AMOUNT OF BULLSHIT YOU'RE WILLING TO BUY FROM FRANK DRAKE

But seriously, there's loads of intelligent life. It's just not screaming constantly in all directions on the handful of frequencies we search.

Explanation

This comic is multi-layered, and seems to be Randall's take on the Fermi paradox.

For starters, the Drake equation is a model developed by (and named for) Frank Drake, an American astrophysicist, for estimating the number of communicating life forms in our galaxy.

Even if there is life on other planets, most life forms will not establish civilizations. However, if there are any communicating civilizations, their messages would have to travel for hundreds, thousands, or hundreds of thousands of years to reach us, and then our response would take an equivalent amount of time, leaving them waiting for thousands and thousands of years or more, and probably even more than that. Any response, from their perspective, would take at least twice as long as the message took to reach its destination.

All the factors involved in the equation are difficult to measure or estimate. No number is determined with sufficient accuracy, so the equation is a guideline for a thought experiment at best, and just "bullshit" at worst.

The title text makes fun of the Search for ExtraTerrestrial Intelligence (SETI) project, which was founded by Frank Drake, about the searches for intelligent life on other planets by looking for radio communications and the intelligence of their researchers. Nearly nothing, if not

nothing, restricts potential extraterrestrial communications to the frequencies that SETI searches at any given moment. Even if another civilization communicated on one of SETI's search frequencies, they would most likely live extremely far away. Additionally, an extraterrestrial source that doesn't know we're here would have to send a constant and powerful signal in all directions for us to notice it. This serves to show how ludicrous it may seem to assume that any intelligent species is wasting too many resources trying to communicate with us or any other species in the galaxy.

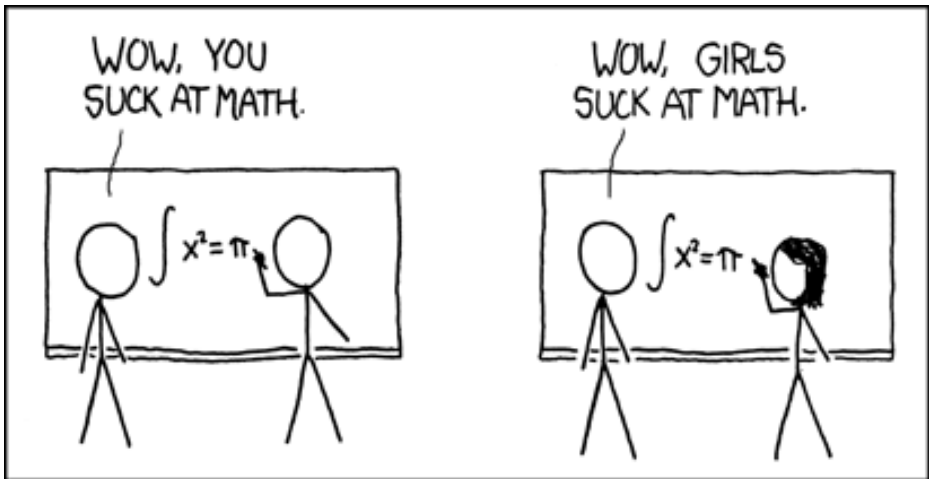
The SETI project is searching at the 21 cm Hydrogen line, which, although considered a favorable frequency for communication with potential extraterrestrial civilizations, is not used by humans. Therefore, a SETI-like organization would have a hard time finding Earth.

The title text suggests that Randall does not think Drake is a nutjob; he just has a more conservative expectation of discovering extraterrestrial life.

638: The Search further discusses the difficulty of methods of finding extraterrestrial life. 718: The Flake Equation presents another alien-related equation.

#385: How it Works

February 18, 2008



It's pi plus C, of course.

Explanation

The comic reveals discriminative jargon against women when doing tasks such as mathematics. When a guy does something wrong, it's his own mistake. When a girl does something wrong, it is taken as a confirmation that girls are inferior.

The mathematics displayed is neither semantically nor syntactically correct. To begin with, there should (reasonably) be a dx after x^2 . Adding this, we have an indefinite integral on the left hand side.

The answer given in the title text, $\pi + C$, is just nonsensical: What we want is a function whose derivative is x^2 . Now, $x^3/3$ satisfies this condition. However, since adding a constant to a function does not change its derivative, the full answer is (any function of the form) $x^3/3 + C$, where C is any fixed number. The "plus a constant" part is very easy to forget, and might even be omitted by a (sloppy) professional mathematician. So if someone really gave the answer π , "you forgot to add a constant" would be a pretty funny remark, because in one way it's true, but on the other hand it wouldn't quite be the main thing to worry about. (It is especially inane as π itself is a constant.)

It would also be possible to fix the equation by adding bounds of integration, so that π becomes the area below a section of the curve x^2 . That is called a definite integral, and there would be no "+ C". The bounds would have to

be somewhat awkward though; if 0 was the lower bound, the cube root of 3π would have to be the upper.

A more complicated but not entirely unlikely guess is that the equation is meant to represent the Gaussian Integral,

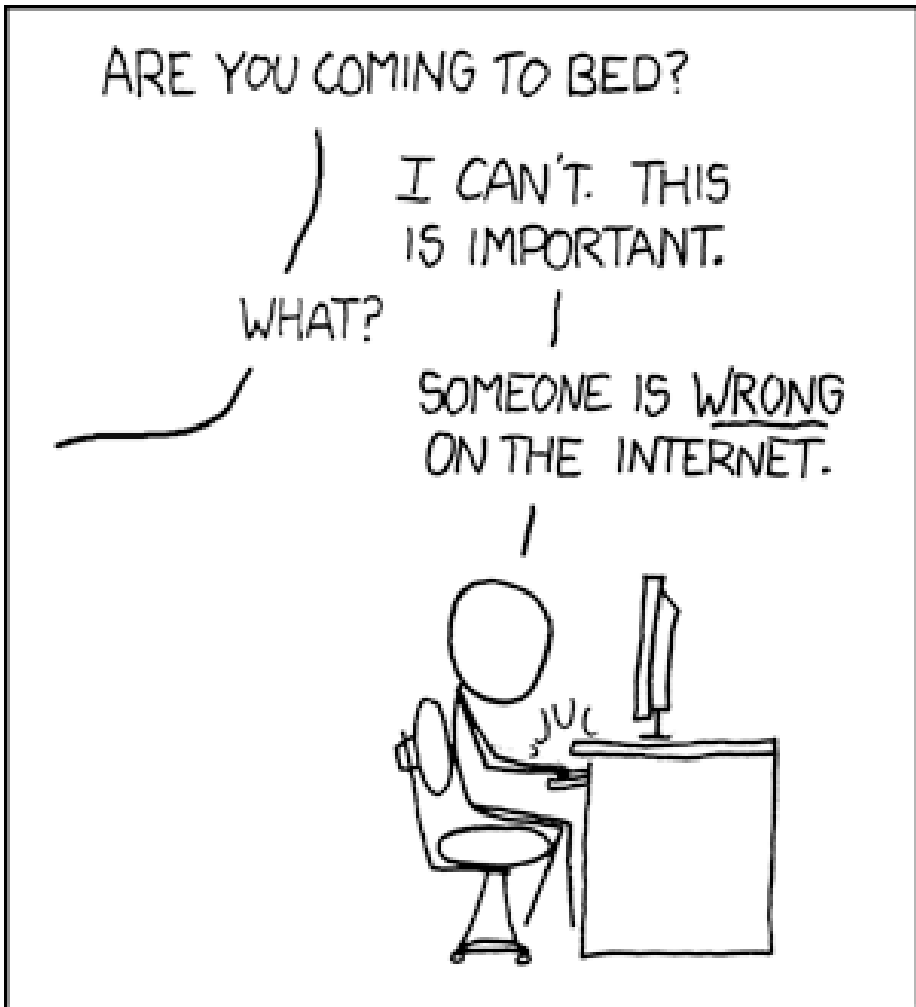
$$-\infty \int +\infty e^{-x^2} dx = \sqrt{\pi} .$$

However, the person writing only vaguely remembers this identity, and even forgets about basics like adding dx and the bounds of integration. This would indeed support the view that the person sucks at math.

The correction/improvement attempted in the title text is just the average student's first guess when asked to reconsider an equation where the bounds of integration are missing. If the situation is actually about said integral, this is no proof of competence either.

#386: Duty Calls

February 20, 2008



What do you want me to do? **LEAVE?** Then they'll keep being wrong!

Explanation

Cueball, and many people everywhere, feel an irrepressible urge to correct people on the Internet, and often get intensely invested in arguments over mundane or insignificant topics. In this comic, Cueball is presented as an exaggerated example of one such arguer. His statement that "This is important" shows his excessive investment in whatever (unnamed) topic he is arguing about. Additionally, Cueball's interpretation of the argument as "someone is wrong, I need to correct them" rather than "someone disagrees with me, I should learn from them" parodies Internet arguers' insistence in the obvious, objective superiority of their viewpoint. The phrase "Duty Calls" used in the title is traditionally used in much more dramatic contexts (say, by a police officer, firefighter, doctor, etc. when talking about their job), so applying it to the job of arguing on the Internet is a humorous mismatch that puts Cueball's disproportionate investment into perspective. In 955: Neutrinos another incarnation of Cueball is cured of a similar disease. A much later comic is simply called 1731: Wrong, but here it is not the other people who are wrong! A callback to this comic was made in 2051: Bad Opinions.

The title text reinforces the absurd nature of his emotional investment in this argument. His reasoning that "they'll keep being wrong!" if he leaves suggests that the only solution he sees is to continue to argue until everyone on the Internet has agreed with him on all

issues—a ridiculously impossible plan. By taking this satire to its logical conclusion—an eternity of arguing on the Internet with no time for pleasure in real life—Randall reminds the reader that getting emotionally involved in Internet arguments at the expense of real life is a terrible, terrible idea.

Alternative interpretation[edit]

There are a lot of people in the Internet.[citation needed] Some percentage of those people are objectively wrong about known things. In consequence, there are a lot of wrong people in the Internet. So, correcting those people is a never ending task. Also, some of those people are wrong because they are cranks, and won't accept even a clear demonstration of their error. But the people posting corrections can self-justify their effort because they are helping the lurkers who otherwise could be led astray by the errors published.

#387: Advanced Technology

February 22, 2008

IT'S NEAT HOW YOU
CONTAIN A FACTORY
FOR MAKING MORE
OF YOU.



We are sexy, sexy Von Neumann machines.

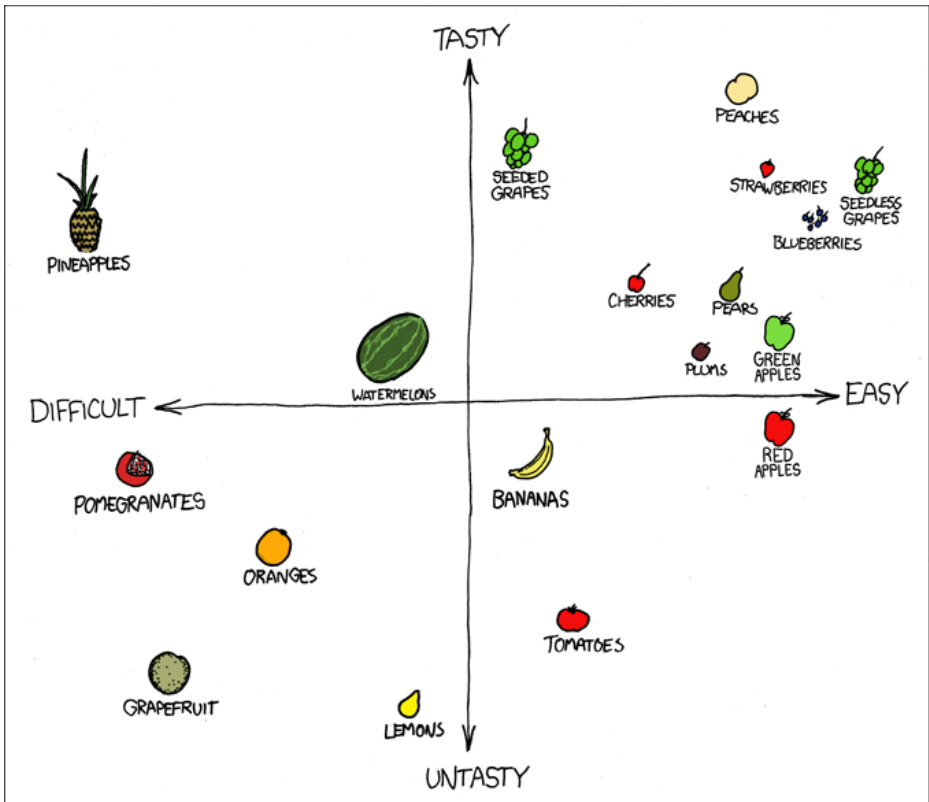
Explanation

Cueball is fascinated by Megan's uterus—because it can create a copy of herself (albeit not an identical copy). Despite how advanced technology is, humans still have not been able to create a machine that replicates itself, an accomplishment to which only biological organisms can lay a claim. Judging by Megan's body language, she probably didn't consent to this inspection of her abdomen, and could even be a random woman that Cueball doesn't know personally or only just met.

The title text refers to a Von Neumann machine, what is usually called "Von Neumann probe" or "Self replicating machine," a machine that would be capable of building a fully functional copy of itself. It just takes sex involving two individuals of a different sex to start the human replication factory.

#388: Fuck Grapefruit

February 25, 2008



Coconuts are so far down to the left they couldn't be fit on the chart. Ever spent half an hour trying to open a coconut with a rock? Fuck coconuts.

Explanation

This comic consists of a chart where Randall has plotted fruits according to two criteria: ease/difficulty to eat on the horizontal axis and tastiness on the vertical axis. The Y-axis goes from "tasty" at the top to "untasty" at the bottom. The X-axis goes from "easy" on the right to "difficult" on the left.

For instance, pineapples are deemed fairly tasty but very difficult to eat, whereas (seeded) grapes are very tasty and somewhat easy, and logically seedless grapes are roughly equally tasty but easier to eat.

Obviously, being easy to eat is preferable to being difficult, and being tasty is preferable to being untasty, so the "best" fruits (regarding these two aspects only) are in the top-right corner, and the worst in the bottom-left; additionally, in the top-left corner are the "difficult-but-worthy" fruits, and in the bottom-right one, the "not-very-tasty-but-at-least-they're-easy-to-eat" ones.

The individual ratings of each fruit are subjective -- very obviously in the case of tastiness, and more subtly for difficulty. Randall does not explain his criteria for ranking the difficulty of each fruit, and it is likely based on only personal experiences. Someone who has grown up in an area where pineapples are plentiful is likely to be more adept at skillfully preparing them. The discrepancies between how Randall has rated certain

fruits and how others believe they should have been rated caused a surprising level of controversy. Nine years later, a comic about the best tasting foods 1811: Best-Tasting Colors was released, which also generated a lot of discussion. That comic indicated that Randall had changed his taste over the years. Later, Randall suggests using a 1949: Fruit Collider to create a pineapple with apple skin, thus combining tastiness with ease to eat.

According to the chart, Grapefruit is the third hardest fruit to eat, as well as the second least tasty fruit (from the ones listed at least). Eating one of them is like spending too much of one's time and energy without much reward. Hence Randall's quip in the title: "Fuck grapefruit."

In the title text, Randall mentions coconuts. He says that he would have to put them so far down to the left on the chart (not far down, just far down towards the left), that they would not fit in this chart. He thus states that it is so much more difficult to eat (especially to open) coconuts than the usual mainstream fruits such as the ones plotted here. If he did include coconuts in the chart, the rest of the fruits would all be pushed to the right side of the chart. He does not say that he does not like to eat the fruit. (Although it has "nut" in its name, the coconut is actually a stone fruit and thus belongs on a chart of fruit.) Having spent half an hour trying (in vain?) to open a coconut, Randall also only has one thing to say about them: "Fuck coconuts." However, harvesting just the "milk" is pretty easy, as you can poke a sturdy stick or metal pole into one of three spots located on the

coconut. These spots are lighter and slightly indented from the rest of the coconut and form a triangle shape.

A similar problem is later displayed in a small scatter plot of the capabilities vs cuteness of Mars Rovers in 2433: Mars Rovers. The plot has 3 types of rovers (5 rovers, but two times two are very similar). But far outside the plot to the right is a very cute rover, that did not fit inside the actual plots axis. Of course in this case it actually possible to draw them all, and the X-axis could have been drawn longer to include the last rover! But it is made like this to make a point, that is similar to the one made in the title text of this comic.

In 1701: Speed and Danger, another scatter plot shows exactly what happens when one point is inserted into such a plot if it is far removed from all the other points, in this case even on both axes.

Randall uses similar diagrams in both 1242: Scary Names, 1501: Mysteries and 2466: In Your Classroom, which also contain different items. The first two also have an extra point, and the last two extra points mentioned in the title text. Only the first and the last comics points are also off the chart, whereas for the second the description of the point is too long to fit on the chart. Extra info outside the chart is also used in the title text of 1785: Wifi, but this is a line graph.

Table[edit]

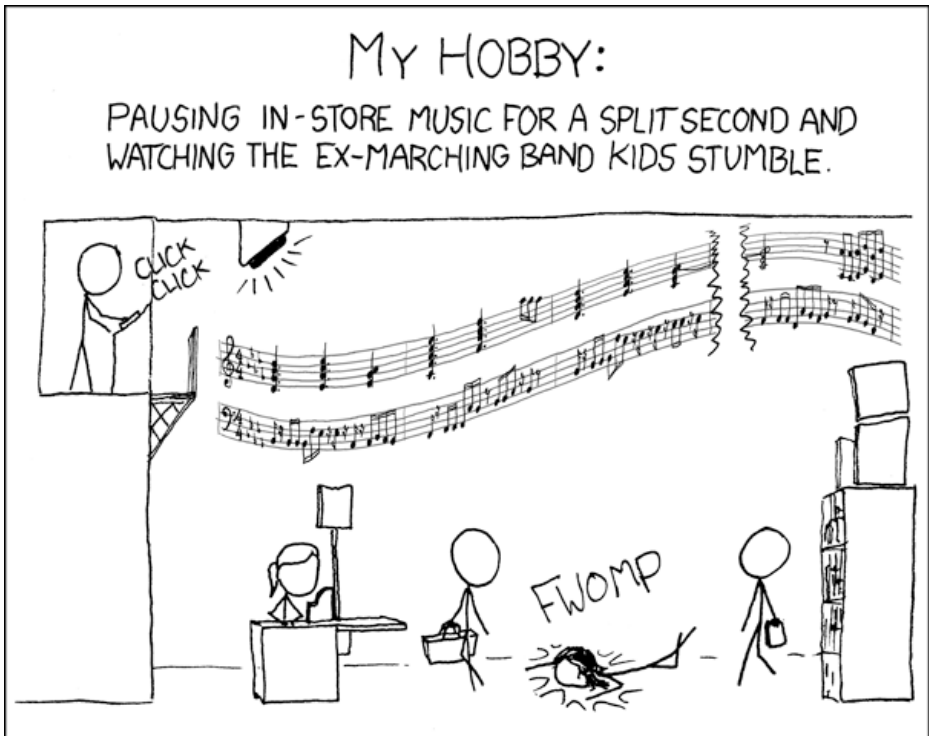
The table below lists approximate coordinates for each fruit using a scale of -100% (untasty/difficult) to 100% (tasty/easy). The

coordinates are based on the included fruits, any new items added outside the current range (e.g. Coconuts) would cause the scales to be reassigned, and thus change the coordinate values of existing items.

The coordinates have been found by measuring each fruit from the center of the drawing (not the center of mass, but center from left to right/top to bottom) to the two axes. The axes are hand drawn, which is clearly visible. The numbers have been obtained by measuring to the nearest point of each axis, not taking into account that the axes are not perfect straight perpendicular lines.

#389: Keeping Time

February 27, 2008



You can identify them ahead-of-time -- they lead with their left foot when the music starts.

Explanation

This comic is part of the “My Hobby” series. Randall, knowing how marching band members sync with surrounding music, decides to make them trip by pausing the music played in a store.

Listen to the music played here.

A member of a marching band, after spending seasons marching in time to their music for their shows, ends up naturally walking with the rhythm of any music they hear around them, like at a shopping mall. Pausing the music for a split second would throw off the rhythm, supposedly enough to cause them to fall. The line of music in the comic is a piano reduction of a well-known song, linked here. Randall talks about this music line in one of his talks.

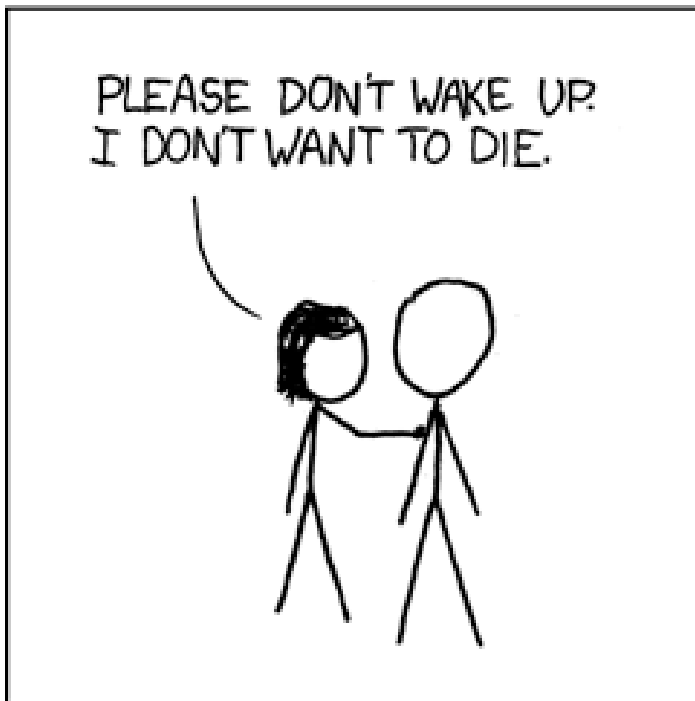
The title text tells us how to identify marching band members, as they tend to naturally start with the left foot.

From xkcd: volume 0:

#390: Nightmares

February 29, 2008

WHEN I GOT USED TO THE
REGULAR NIGHTMARES, MY
SUBCONSCIOUS GOT CREATIVE.



Well, *I* think I'm real. Look at me. Look at my face. Cut me and I'll bleed. What more do you want? Please don't go.

Explanation

This comic shows Cueball's plight with nightmares. Since he's gotten used to normal nightmares, his subconscious has begun giving him dreams where he sees his dream characters imploring him to not wake up, lest they perish, as they only exist in his dream. The horror comes from the idea that by the simple, everyday action of waking up, Cueball would be extinguishing a life. This would also necessitate that Cueball is conscious when he is asleep, a type of vivid dream known as a lucid dream.

The title text continues this theme, with Megan claiming that she is really real (presumably in response to the allegation that she isn't real, and merely a dream character), and begging Cueball to stay with her.

#391: Anti-Mindvirus

March 03, 2008

YOU JUST WON THE GAME.

IT'S OKAY! YOU'RE FREE!

I'm as surprised as you! I didn't think it was possible.

Explanation

The Game is a virus-like mind game. The rules are as follows:

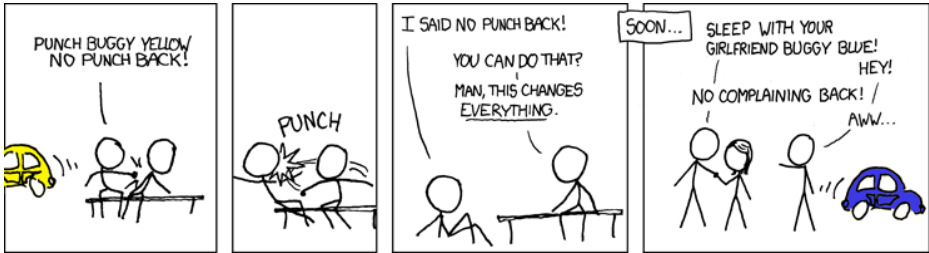
From the simple way the rules are set up, there seems to be no such thing as winning The Game, except possibly by permanently forgetting about its existence. This comic gives you an alternative way to win, by simply telling you that you win and are now free from the mind virus.

An alternate interpretation may be that reading this comic causes you to lose the game, because it reminds you of The Game.

The title text states that Randall didn't know it was possible to win The Game, and he was surprised just as much as the reader.

#392: Making Rules

March 05, 2008



I never understood why someone would expect me to accept their rules right after they'd punched me. I'm sure it's all very symbolic or something.

Explanation

"Punch Buggy" is a game played by two people with a view of traffic (often, but not here, during a car ride). For each Volkswagen Beetle that passes nearby, the first player to see it is entitled to punch the other player, while calling "Punch Buggy" followed by the color of the spotted Beetle. Traditionally the other player is permitted to return the punch, unless the first player also calls "no punch back."

Interestingly, the second punch has a small effect around it, and knocked the other guy to the ground, rather than just lines, implying that that punch was much stronger in retaliation and that the second person is stronger.

Many people will just assume that the game is always being played and punch you out of the blue, giving you no chance to opt out. Cueball, however, finds the idea that he can simply be roped into a game without consent odd, and decides to make the game stakes more desirable than just the right to punch someone, and (seemingly successfully) uses the same principle to secure the right to sleep with the other man's girlfriend.

The title text is Randall elaborating on how ridiculous these types of games are, such as the idea that after being punched, one should just accept a "no punch back" rule.

In the UK, a common variant uses a yellow Mini rather than the VW Beetle. Other examples of this type of game

are the Car numberplate game and Padiddle.

#393: Ultimate Game

March 07, 2008



RIP, Gary.

Explanation

Gary Gygax was a game designer best known for co-creating the iconic nerd pastime Dungeons and Dragons (D&D); as such, he is commonly described as the "father of D&D." He died on March 4, 2008, three days before this comic was released. It made him the first person to receive tribute in conjunction with his death on xkcd, but not the last.

The idea of playing games (typically chess) with supernatural entities in exchange for one's soul is an old one and has been referenced in many works, but mainly known in the form of playing Chess against the personified version of Death, which was made famous in Ingmar Bergman's film *The Seventh Seal* (1957). The last part of this trope is used in this comic. Here, the specific twist is that the victim can choose which game they want to play. Naturally, it is only fitting that Gary would challenge Death to D&D. The trope was later revisited as one of the tips in 1820: Security Advice.

The problem is that Dungeons and Dragons isn't so much a game as it is a set of rules for describing stories. It requires the intervention of a Dungeon Master (or DM) to create a scenario that the players' characters must overcome. It's unclear exactly how the game between Gary and Death works, but given that D&D generally takes a long time to play due to the setup time and large amount of dice-rolling, and the fact that Gary seems to keep adding extra rulebooks (official or pseudo-official

books that add new classes, items, spells, etc. for players to use), it's understandable why it would take longer than Death's boss would like.

Part of the humor in this comic comes from the fact that Death's boss, who would presumably be an extraordinarily powerful entity, appears to be a completely ordinary man in an ordinary office, complete with bald patch and potted plant.

Death's usage of the name "Jesus" in the final panel may be considered ironic, given that he's, well, Death.

But it does make a different kind of sense when you consider Jesus a personal enemy of Death (Revelation 20:14).

#394: Kilobyte

March 10, 2008

THERE'S BEEN A LOT OF CONFUSION OVER 1024 vs 1000, KBYTE vs KBIT, AND THE CAPITALIZATION FOR EACH.

HERE, AT LAST, IS A SINGLE, DEFINITIVE STANDARD:

SYMBOL	NAME	SIZE	NOTES
kB	KILOBYTE	1024 BYTES <small>OR</small> 1000 BYTES	1000 BYTES DURING LEAP YEARS, 1024 OTHERWISE
KB	KELLY-BOOTLE STANDARD UNIT	1012 BYTES	COMPROMISE BETWEEN 1000 AND 1024 BYTES
KiB	IMAGINARY KILOBYTE	1024 $\sqrt{2}$ BYTES	USED IN QUANTUM COMPUTING
kb	INTEL KILOBYTE	1023.937528 BYTES	CALCULATED ON PENTIUM FPU.
Kb	DRIVEMAKER'S KILOBYTE	CURRENTLY 908 BYTES	SHRINKS BY 4 BYTES EACH YEAR FOR MARKETING REASONS
KBa	BAKER'S KILOBYTE	1152 BYTES	9 BITS TO THE BYTE SINCE YOU'RE SUCH A GOOD CUSTOMER

I would take 'kibibyte' more seriously if it didn't sound so much like 'Kibbles N Bits'.

Explanation

This comic pokes fun at the confusion over the definition of a kilobyte. Historically, 1024 bytes was called a kilobyte for convenience purposes (same with megabyte and gigabyte); this usage was frowned upon by both the International Bureau of Weights and Measures and the Institute of Electrical and Electronics Engineers, but both let it slide as they had more important things to deal with. Later, hard drive manufacturers realized they could save money by selling hard drives marketed X amount of gigabytes and declare that they meant it as a literal 1,000,000,000 bytes (a 7% difference). Despite its iffy origins, the official definition now states that 1 kilobyte is 1000 bytes, however some continue to use the older meaning referring to 1024. The first row of the table is simply mocking this discrepancy.

The second row is Randall's interpretation on how Stan Kelly-Bootle would approach this problem. Kelly-Bootle is known for writing *The Computer Contradictionary*, which satirizes the jargon and language of the computer industry. Kelly-Bootle was likely motivated to write this work after working for several years at IBM, a company infamous for its excessive use of acronyms in the work place. Averaging the two definitions together to get 1012 bytes is simply a humorous approach that Kelly-Bootle would likely have taken ("Should array indices start at 0 or 1? My compromise of 0.5 was rejected without, I thought, proper consideration." — Stan Kelly-Bootle). The serendipitous fact that the initials of Kelly-Bootle's

name are "KB," the same letters used to abbreviate the word "kilobyte," adds a layer of plausibility to the joke. This is the first of Randall's many humorous compromises.

The imaginary kilobyte simply plays on the fact that complex analysis is required in quantum computing in relation to quantum mechanics. The imaginary number is represented as i and has a value of the square root of -1 . This is a pun on the fact that KiB is used for the "binary kilobyte" (occasionally "kibibyte"), which is standardized at 1024 bytes.

The Intel kilobyte mocks the Pentium floating point unit that, in 1994, became notorious for having a major flaw in its floating point division algorithm that gave slightly erroneous results.

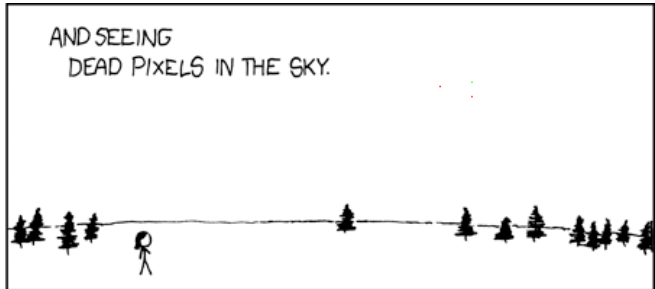
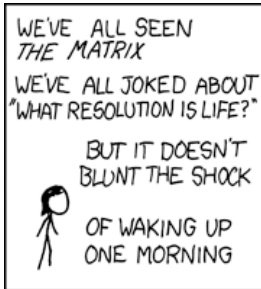
The smaller, drivemaker's kilobyte mocks a business model for handling higher prices that keeps prices constant but reduces quantity, also known as Shrinkflation. The food industry has been notorious for decreasing quantity of food and keeping prices the same instead of increasing prices and keeping quantity the same. Randall is suggesting that if the computer industry tried to do this with hard drives, it could have humorous results such as smaller number of bytes in a kilobyte. This discrepancy increases with increasing drive size. The trend humorously suggested in the comic, however, would make the drivemaker's kilobyte 1024 bytes in 1979, 1000 bytes in 1985, 840 bytes in 2025, and 0 bytes by 2235.

The baker's kilobyte is a play on the baker's dozen, which is 13 instead of 12. A baker's byte with 9 bits to the byte would result in a total of 9216 bits in a 1024 byte kilobyte. Converting this into "normal" bytes (with 8 bits), we divide 9216 bits by 8 bits per byte to get 1152 8-bit bytes to the baker's kilobyte.

In the title text, Randall mentions the definition kibibyte, which is defined more precisely. The binary prefix kibi means 2^{10} , a portmanteau of the words kilo and binary. But he doesn't like the word because it sounds like the dog food Kibbles 'n Bits.

#395: Morning

March 12, 2008



I'd press on them to try to unstick them, but I can't reach.
Can we try cycling day and night really fast?

Explanation

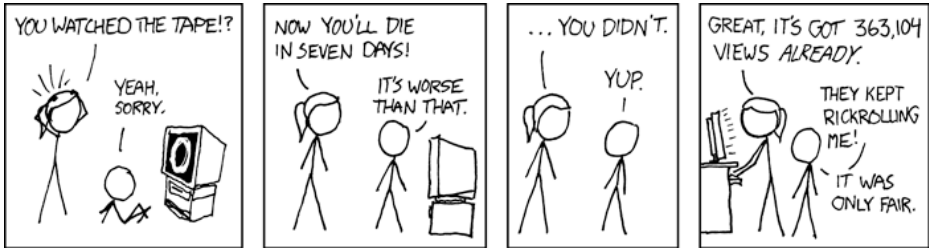
This comic makes reference to the idea, as presented in the movie *The Matrix*, that reality is a computer simulation. In LCD screens, especially TFT LCD, a dead pixel is a pixel that does not work properly, usually set as black or as some other color. Megan realizes that the reality is a computer simulation when she sees dead pixels in the sky, indicating that what she sees is an LCD screen.

In the last panel of the comic, there are two red and one green pixel that look exactly like actual dead pixels.

The title text refers to usual techniques for fixing a dead pixel. One way is to apply pressure and release it, which isn't possible for Megan due to the distance of the sky. Another way is to make the area of the screen that the dead pixel is on change colors really quickly, which could happen if the day-night cycle was fast enough.

#396: The Ring

March 14, 2008



On the other hand, poor Samara -- transcoded to FLV. No one deserves that.

Explanation

The Ring is a horror movie released in 2002 based off of the Japanese movie Ringu. In it, there is a video tape that causes everyone who watches it to die after seven days. However, the viewer can prevent their death by making a copy of the tape and giving it to someone else.

A young Cueball watches the tape and prevents his own death by "copying" the tape and uploading it to a video-sharing website, presumably YouTube. Cueball not only got one person to watch it, the requirement for escaping death, but 363,104 people, all of whom are most likely going to die in seven days. (For scale, the most-watched video at the time of the comic's publication had 78 million views.)

Rickrolling is an Internet meme where someone is lured into clicking on a video link of Rick Astley singing "Never Gonna Give You Up." When someone is rickrolled, they usually get very upset. Cueball states in the comic that he uploaded the tape to get revenge on everyone who rickrolled him, though it was obvious that he would likely kill many more people than those who rickrolled him (or those who've rickrolled anyone else).

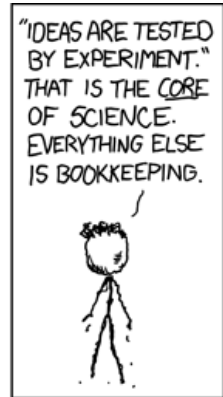
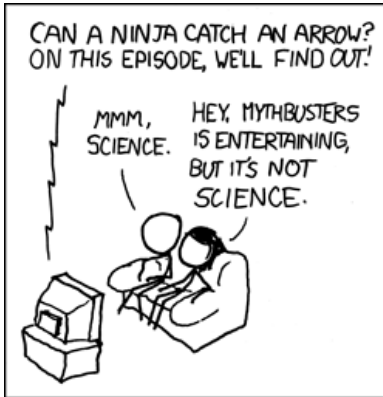
The title text refers to the file format used by the YouTube player. Historically, YouTube was famous for having extremely poor quality videos, because their Internet connections were slower and server storage space was expensive. So, all videos were transcoded into a

very low quality FLV (flash video) format.

The girl shown in the video tape — a major part of The Ring series — is named Samara. Posting the tape on YouTube would result in heavily compressed videos in the FLV format. This, presumably, would reduce the quality of Samara's apparition. The title text also implies that nobody deserves that, although rickrolling is (according to young Cueball) apparently punishable by death.

#397: Unscientific

March 17, 2008



Last week, we busted the myth that electroweak gauge symmetry is broken by the Higgs mechanism. We'll also examine the existence of God and whether true love exists.

Explanation

In the first and second frames, Megan can be seen accusing MythBusters of not actually "doing science" because of its lack of rigor - a debate beyond the scope of this Wiki. The zombie of deceased physicist, Richard Feynman, comes to explain to Megan that she has failed to recognize the purpose of MythBusters. He explains that MythBusters' value is getting people to accept and understand the importance of experimentation in the scientific method, and that more complex lessons (such as on rigor) would be wasted on people who don't understand those basics.

In the last frame, Cueball attempts to save himself and Megan from zombie Feynman by implying that physicists, being extremely intelligent, would have more desirable brains. Also, in a science lab, the number of brains available would be higher than just two. Feynman's closing remark implies that string theorists have no brains; the joke being that string theorists are presumably less intelligent than Cueball and Megan, who were merely watching television prior to being attacked, and probably also a pun on branes. For another instance of Randall knocking string theorists, see 171: String Theory. This notion fits appropriately with Feynman's description of the core of science. Moreover, Feynman's own career involved applying physics to real world applications (such as for the Manhattan Project), whereas the work of string theorists is theoretical and untested.

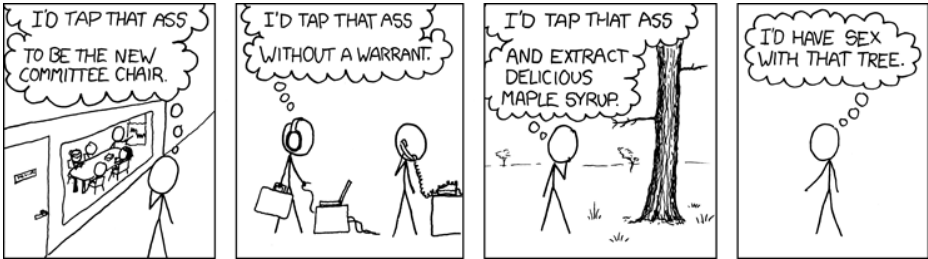
The title text starts by rebounding against the complaint of validity as science by purportedly tackling a really big scientific inquiry. Then he veers away into two far more esoteric proposed fields of study, of which at least one is not even determinable by the scientific method, probably both.

The Mythbusters episode being watched is likely Episode 109 – "Ninjas 2", which was the second episode in which the Mythbusters attempted to catch an arrow mid-flight. The voice from the television is likely that of Robert Lee, who provided the narration for Mythbusters. It should also be noted that the ninja mentioned in this is the inaccurate pop culture iteration not the historical Shinobi no Mono. for more accurate info on the Shinobi search "Antony Cummins".

Zombies are a recurring theme in xkcd, particularly zombie scientists, which has also occurred twice after this comic with Paul Erdős in 599: Apocalypse and Marie Curie in 896: Marie Curie.

#398: Tap That Ass

March 19, 2008



Hey, when you're done draining the syrup, just leave the hole, okay?

Explanation

In this comic, Cueball either accidentally or purposefully exploits the double meanings of "tap." The phrase "tap that ass" is a colloquialism for "to have intercourse with that person" and is most likely how the reader expects the phrase to be used. However, throughout the comic, Cueball uses the phrase ambiguously.

In the first panel, it is possible that Cueball is using "tap that ass" sexually. However, it is more likely that he is using "tap" to mean "pick" or "choose," in which case he would be the one choosing the next committee chair. "That ass" refers to one of the individuals in the meeting room to be picked for the position.

In the second panel, "tap" is referring to wiretapping. The Cueball character with the headphones on has just unplugged his headphone. This suggests that he and his colleague at the phone were just done with the wiretapping. In this scenario, it is strange that the colleague is still on the phone instead of hanging up. However, it would be much stranger to wiretap someone in plain eyesight, unless that person is blind. "Ass" likely refers to the person they have just wiretapped. Cueball says he'd tap that ass "without a warrant," suggesting that they had one in this situation.

In the third panel, "tap" is referring to extracting sap from trees. A sexual connotation would make no sense in this context. "That ass" refers to the maple tree.

The final panel reveals that Cueball was purposefully implying the sexual meaning of "tap that ass" all along, even though he framed it in a non-sexual context. He reaffirms his previous statement from the third panel by turning toward the direction of the third panel (thus implicitly breaking the fourth wall) and asserting "I'd have sex with that tree." "That tree" refers to the tree from the previous panel.

Alternatively, Cueball may have finally realized that he indeed wanted to have sex, but instead of using the euphemism "tap that ass," he says it literally.

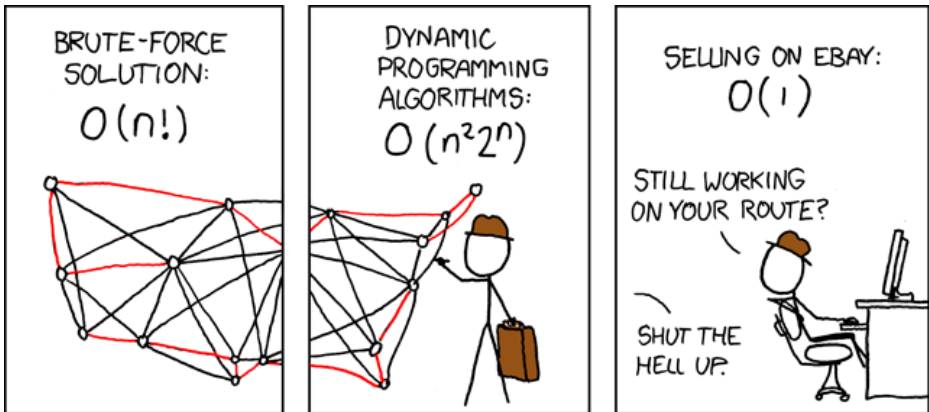
The title text features a request from Cueball from the last panel to Cueball from the third panel. He asks Cueball not to plug up the hole left behind from tapping the tree, so he can have sex with it.

In xkcd: volume 0, below the comic is a bonus comic, replete with horrible puns:

("Wood" also meaning "erection" and "son of a beech" sounding like "son of a bitch".)

#399: Travelling Salesman Problem

March 21, 2008



What's the complexity class of the best linear programming cutting-plane techniques? I couldn't find it anywhere. Man, the Garfield guy doesn't have these problems ...

Explanation

The travelling salesman problem is a classic problem in computer science. An intuitive way of stating this problem is that given a list of cities and the distances between pairs of them, the task is to find the shortest possible route that visits each city exactly once and then returns to the origin city. A naïve solution solves the problem in $O(n!)$ time (where n is the size of the list), simply by checking all possible routes, and selecting the shortest one. However, this approach will take a long time as the number of possible routes increases superexponentially as more nodes are included.

A more efficient dynamic programming approach, the Held-Karp algorithm, yields a solution in $O(n^2 2^n)$ time. These times are given using Big O notation, which is commonly used in computer science to show the efficiency or complexity of a solution or algorithm.

The joke is that the salesman selling online (say on eBay, Amazon Marketplace, or other virtual marketplace) does not have to worry about this problem, since he does not need to travel (which makes the time to find the best solution $O(1)$), to which the travelling salesman angrily responds, "Shut the hell up."

The title text wonders about the time complexity of the cutting-plane method, which is sometimes used to solve optimization problems.

The last sentence suggests the downside for Randall of drawing comics about computer science; he sometimes encounters problems to which he cannot find the answer, whereas authors of simpler comics such as Garfield do not have this problem. This is also likely a reference to 78: Garfield, which parodies Garfield's simplicity.

The map almost certainly depicts the United States, with the locations highlighted suspected to be (from left to right): Seattle, San Francisco, Los Angeles, Phoenix, Denver, Minneapolis, Dallas, San Antonio, Houston, Chicago (cut off), Detroit, Atlanta, Miami, Washington D.C., Philadelphia, New York, and Boston.

This is so far the only comic featuring the Brown Hat character.

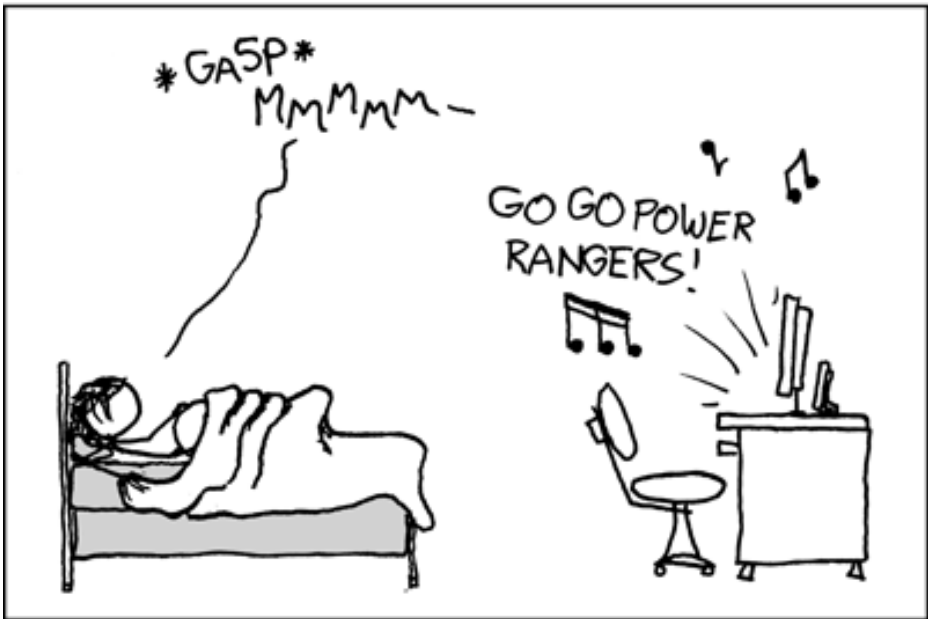
Also see earlier strip 287: NP-Complete.

#400: Important Life Lesson

March 24, 2008

IMPORTANT LIFE LESSON:

IF THERE'S ANY POSSIBILITY OF SEX, DO *NOT* LEAVE YOUR MUSIC LIBRARY ON "SHUFFLE ALL."



I didn't even know I *had* the Monty Python 'Lumberjack' song.

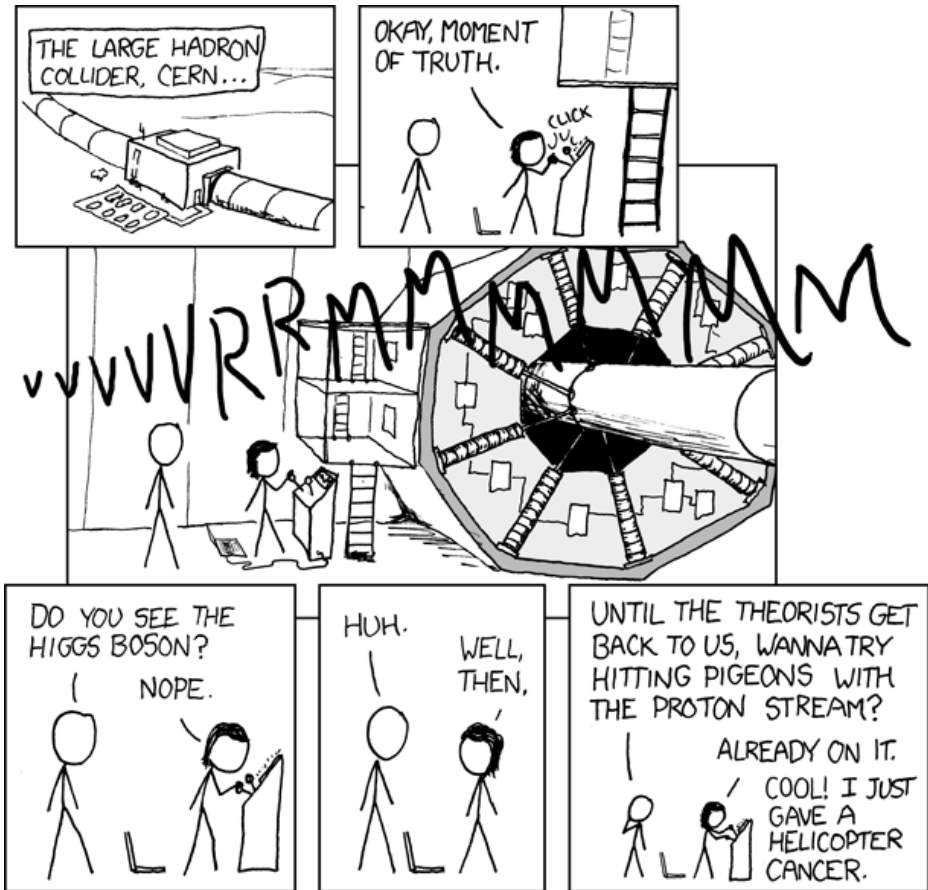
Explanation

It's common to have music playing in the background when two individuals decide to engage in sexual behavior. However, some people have a lot of silly or funny songs in the same music library as their more dramatic or romantic song choices. If the library is left to randomly choose songs from the whole library, those more whimsical songs could easily come up, suddenly ending the intimate mood.

Cueball is performing cunnilingus on Megan, while a particularly goofy song, the Power Rangers Theme, plays in the background. The title text alludes to an even sillier song, the Monty Python song Lumberjack, which is about a transvestite lumberjack.

#401: Large Hadron Collider

March 26, 2008



When charged particles of more than 5 TeV pass through a bubble chamber, they leave a trail of candy.

Explanation

The Large Hadron Collider (LHC) is the world's largest particle accelerator, used in physics research, and particularly for finding the Higgs Boson. The Higgs Boson is one quantum excitation of the Higgs Field, in the same way as the photon is a quantum of the electromagnetic field. Interaction between particles and the Higgs field can explain why other particles have mass. The Higgs Boson was first detected in 2012, and confirmed to exist in March 2013. It was the last particle of the Standard Model of Physics to be experimentally confirmed.

At the time of this comic's writing, the LHC was nearing completion, and the comic imagines experimental physicists starting up the LHC for the first time. It has taken many years to complete, and its intended purpose was to be able to measure the Higgs Boson. In the comic, the experiment fails to observe the Higgs Boson. The researchers can only wait for the theorists to determine what may have happened, if something went wrong, or if they can come up with a testable hypothesis. In 2012, and after many years of experimentation and observation, the Higgs Boson was observed at CERN's LHC. This comic imagines what the researchers may have done with the LHC in between tests.

After the experiment failed, the bored physicists try frying pigeons with the proton stream and instead end up giving a helicopter cancer, both of which are

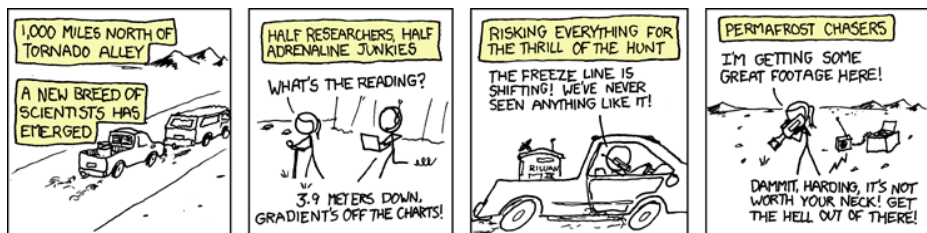
impossible. This is because the stream is contained within the LHC, and non-organic entities can't get cancer.[citation needed] However, the proton stream could cause considerable damage to pigeons or humans, as the U-70 synchrotron did to Anatoli Bugorski in 1978.

At that time there was also a big concern by some people that the LHC could produce microscopic black holes. However, cosmic rays regularly strike Earth's atmosphere with particles at higher energies; thus, if the proposed doomsday scenario were possible, it should have already happened. Many jokes were published like this video "LHC End of The World Black Hole".

The title text makes another joke about the effects of highly energetic particles, claiming that when they pass through a bubble chamber (an older particle detection device), they leave a trail of candy. TeV means teraelectronvolt and equals 10^{12} eV. 5 TeV is about the energy of the LHC. It is of the order of the energy of a flying mosquito and would never be able to convert a liquid to candy or anything macroscopic.

#402: 1,000 Miles North

March 28, 2008



Twister would've been a much better movie if they'd cut out the bad-guy storm chaser and all the emotional romance crap. All you need for a good movie are tornadoes and scientists. Actually, that's all you need for anything.

Explanation

Spoofing off of tornado chasers are these permafrost chasers, who are just like tornado chasers, but they are chasing very boring[citation needed] permafrost. Permafrost is a layer of ground that never thaws, unlike ground closer to the equator, where the ground freezes in winter and thaws in the spring.

The title text references the 1996 movie *Twister* about a crazy group of tornado chasers trying to drop a probe-releasing device named Dorothy (based on the real-life project TOTO) into the heart of a tornado. However, much of the story was about Bill and his ex, both chasers, falling back in love, another chaser who is fighting Bill for research grants and fame, and a tornado that likes to chase people. Randall comments that the movie would have been better if they had lost all of the above except the tornadoes and the scientist, which is basically all you need for a good movie. And then he continues his musings by saying that tornadoes and scientists "are all you need for anything."

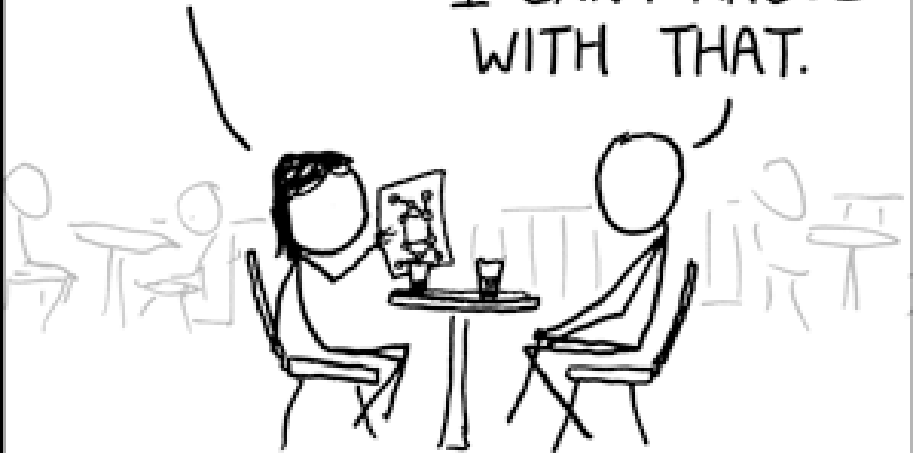
This seems to be the first comic mentioning tornadoes, but since then they have become a recurring subject on xkcd, and in the next two tornado comics, 640: *Tornado Hunter* and 752: *Phobia*, tornadoes and tornado chasers are actually featured.

#403: Convincing Pickup Line

March 31, 2008

WE'RE A TERRIBLE MATCH.
BUT IF WE SLEEP TOGETHER,
IT'LL MAKE THE LOCAL
HOOKUP NETWORK A
SYMMETRIC GRAPH.

I CAN'T ARGUE
WITH THAT.



Check it out; I've had sex with someone who's had sex with someone who's written a paper with Paul Erdős!

Explanation

A graph is a mathematical object consisting of nodes connected by lines called edges. The nodes could represent for example people, and the edges could represent a connection from having slept together. Now, Megan has such a graph. Arguably, a graph that is symmetric is nicer than a regular one, which is why Megan suggests that they should sleep together.

The title text is a small-world joke on the concept of an Erdős number. Paul Erdős was a Hungarian mathematician renowned for his eccentricity and productivity. He holds the world record for the number of published math papers, as well as for the number of collaborative papers. A person's Erdős number is the "collaborative distance" between the person and Erdős. Paul Erdős's Erdős number is 0 by definition. All of his 511 collaborators have the Erdős number of 1; anyone further (excluding Erdős and such an individual) who has collaborated on a mathematical or scientific paper with any of those collaborators has an Erdős number of 2, and so on. Thus, if you have written a paper with someone who's written a paper with someone who's written a paper with Paul Erdős, your Erdős number is 3. If you know a mathematician or are a mathematician, you can calculate their or your Erdős number here.

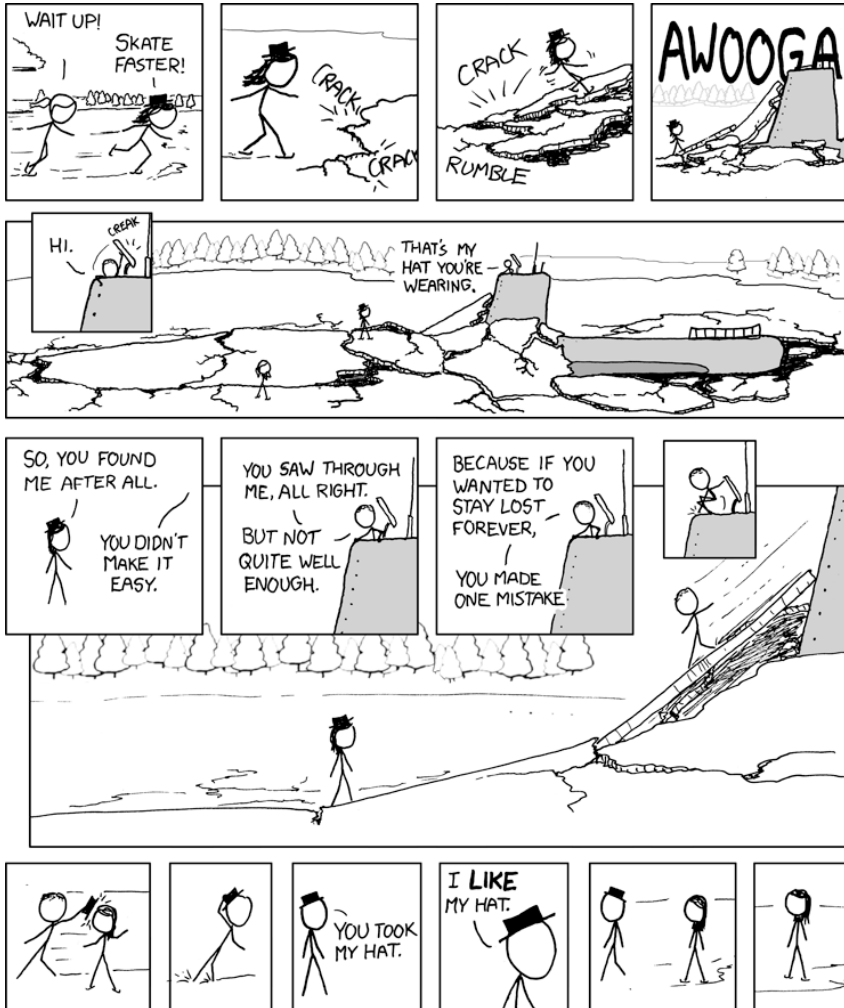
This may also be a reference to Chapter 4 of *Candide*, wherein Pangloss tells the protagonist of the genealogy of his syphilis. He received the disease from Paquette, who

acquired it from a Franciscan, as so on until the lineage starts with one of the adventurers of Christopher Columbus.

In 599: Apocalypse, Cueball actually manages to write a paper with zombie Erdős, thus having a Erdős number of 1.

#405: Journal 3

April 02, 2008



Oh, and, uh, if the Russian government asks, that submarine was always there.

Explanation

In 374: Journal, Black Hat explains to Cueball that a hobby of his is to pretend to write in a journal while on the subway, acting embarrassed if anyone sees. He then proceeds to silently scorn the person once they give him any kind of reassurance.

In 377: Journal 2, however, Danish sees through his ruse. She counteracts it by proving that she understands him, and attempts to resign him to the fact that he will never see her again, thus stripping him of the satisfaction and confidence of a proper social connection. She decamps, abducting his hat in the process. (We also explored the fact that she might be even better than Black Hat. But Black Hat shows his true power and ingenuity.)

Initially vanquished, Black Hat seems to have recovered and tracked Danish down, even to the extreme fringes of the Earth. He tells Danish that although she was able to read him impossibly adequately she blundered one "inconsequential" detail. We are led to believe that this is some mistake in the disguising of her tracks, but then he explains that it was simply how much he values his hat. It may also be the possibility that Black Hat placed a tracking device of some sort on his hat. This way he trampolines her wrath back at her. She thought that he would agonise the loss of her - the only person who understands him - but he subdues her ego when claiming that he likes his hat (implicitly saying that he doesn't care for her). The series continues in 432: Journal 4. He

leaves, taking "her hat" from her.

The title text continues the theme of Black Hat's supernatural ability to troll and to deftly dodge the consequences: If Black Hat stole a military submarine, said military is probably going to be hot on his tail, but he writes it off with: "just tell them it was always here," as if it is no big deal. Black Hat will even be blamed for stealing the submarine in 496: Secretary: Part 3. However, since this is (presumably) the American Senate reviewing him, it may be that he simply has stolen two submarines. It is also possible that the submarine is the American submarine and the title text refers to the Russian Government because their current location is in their territory, and he is shifting any reason for the submarine being there away from himself.

It perhaps may be significant that this comic includes the line "So, you found me after all", given that the previous comic number 404: Not Found was skipped, leading instead to an HTTP 404 Not Found error page.

The destiny of Black Hat is fully known in The Journal.

The whole "Journal" story is:

- 374: Journal
- 377: Journal 2
- 405: Journal 3
- 432: Journal 4
- 433: Journal 5

#406: Venting

April 04, 2008

WHEN I NEED TO BLOW OFF STEAM, I FIND A PARTICULARLY STUPID BLOG COMMENT AND REPLY WITH AN EXHAUSTIVELY RESEARCHED WORD-BY-WORD REBUTTAL, WHICH I SIGN "SUMMER GLAU".

... IN CONCLUSION, ON EXAMINING THE ABOVE POST BY CRACKMONKEY74, AFTER CAREFULLY WORKING MY WAY THROUGH THE HAZE OF SPELLING ERRORS (DOCUMENTED IN SECTION 3), ABUSE OF CAPITALIZATION (SECTION 4), AND GENERAL CRIMES AGAINST GRAMMAR AND SYNTAX (SECTIONS 7-8), I HAVE DEMONSTRATED THAT, BENEATH IT ALL, THE WORK BETRAYS THE AUTHOR'S STAGGERING IGNORANCE OF THE HISTORY AND THE WORKINGS OF OUR ELECTORAL SYSTEM. WHILE THE AUTHOR'S WILDLY SWERVING TRAIN OF THOUGHT DID AT ONE POINT FLIRT WITH COHERENCE, THIS BRIEF ENCOUNTER WAS MORE LIKELY A CHANCE EVENT (SEE STATISTICAL ANALYSIS IN TABLE 5) THAN A RESULT OF EVEN RUDIMENTARY LUCIDITY.

— SUMMER GLAU

P.S. DON'T FORGET TO CHECK OUT THE NEXT SEASON OF THE SARAH CONNOR CHRONICLES THIS FALL ON FOX!



P.P.S. I can kill you with my brain.

Explanation

This is yet another xkcd comic referencing Firefly, but it's not so much about Firefly itself as about Summer Glau. Summer Glau is an American actress best known for playing River Tam in Firefly and Serenity, as well as Cameron in the Terminator: The Sarah Connor Chronicles series. Cueball says that he gives a long and seemingly well-researched reply to a stupid comment on a blog when he feels angry as a way to vent. What we see of his comment begins with Cueball describing the original comment's incoherent and inconsistent spelling and grammar. Then, he proceeds to rip apart the commentator by citing their historical and political ignorance. He signs his comment as "Summer Glau", after which he reminds the blogger to watch the next season of Terminator: The Sarah Connor Chronicles series.

One likely reason that he uses "Summer Glau" is that she is worshipped by geeks the world over, even those incapable of writing coherent blog posts or comments. CrackMonkey74 would not risk responding negatively to the post, just in case it was actually written by Summer Glau, as they don't want everyone to hate them for attempting to argue with her. In this way, Cueball is assured of the last word in this argument, which makes for a most satisfying vent.

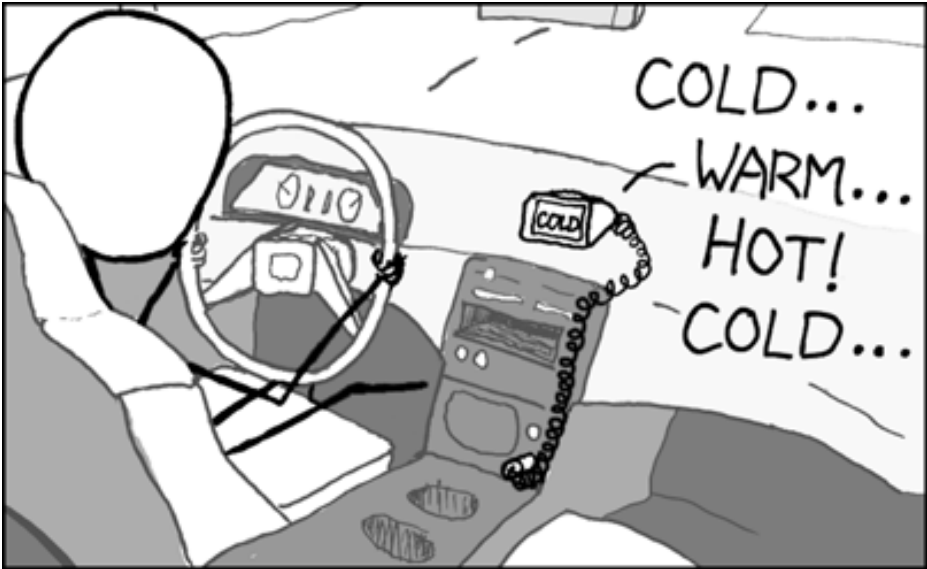
Another possible explanation is that River Tam has a genius-level intellect and is also mentally disturbed.

Given xkcd's trend of comparing Firefly characters to their respective actors (especially in The Race series), Cueball is probably using Summer Glau's name simply because an exhaustively researched blog comment seems like something River Tam -- and thus possibly Summer Glau -- would do. The name CrackMonkey74 also appears in 202: YouTube as one of the clueless YouTube commentators, and later appears in 574: Swine Flu.

The title text refers to the famous dialogue delivered by River Tam in Firefly Episode 11: "Trash".

#407: Cheap GPS

April 07, 2008



In lieu of mapping software, I once wrote a Perl program which, given a **USB GPS** receiver and a destination, printed 'LEFT' 'RIGHT' OR 'STRAIGHT' based on my heading.

Explanation

GPS is a system allowing people to find their location and from that, speed on Earth. It was first developed for the U.S. military, but now it sees international usage for everyday navigation. Many motorists today have GPS devices (sometimes just called GPS's) that can give driving directions electronically.

Hot and Cold is a children's activity/game where one person searches for an unknown object, and the rest must respond "Hot" or "Cold." Other words, such as "warm" and "cool" can be used to describe their distance more accurately. The closer the player is to the mystery object, the "hotter" they are.

This GPS would be extremely difficult to use, as it gives no directions, only telling you how close you are to reaching your destination. The series of instructions spoken ("cold," "warm," "hot," then "cold" again) suggests that Cueball either missed a turn, or that he just passed his destination.

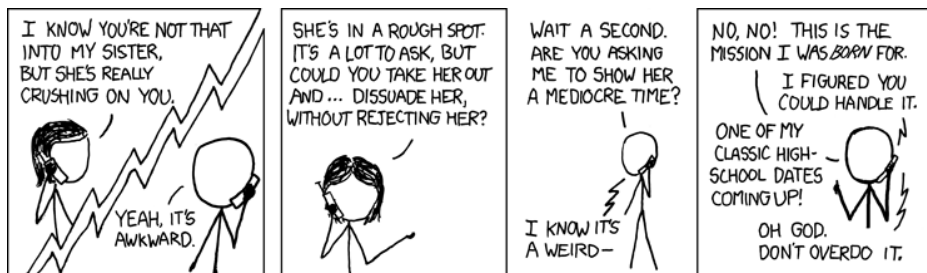
Randall describes a past engineering project of his that can only describe turns "as the crow flies." So, for example, if he was driving north with the destination to the northeast, the GPS would tell him to turn right even if no such turn was legally possible. Perhaps not very functional, but it is a pretty cool thing to build.

While cars go fast and are only allowed to, or able to, use a very limited number of all roads and trails in the world,

this is less so for pedestrians. As a consequence, for hikers, an app that just shows the direction you should be walking in 'as the crow flies' is actually quite a common and useful tool, since a lot of small roads suitable for pedestrians do not show up on maps. Of course, just printing 'left' or 'right' is much more primitive than showing an arrow in the correct direction (compass-like), and often less helpful since on one cross section there can be multiple trails to the right.

#408: Overqualified

April 09, 2008



To anyone I've taken on a terrible date, this is retroactively my cover story.

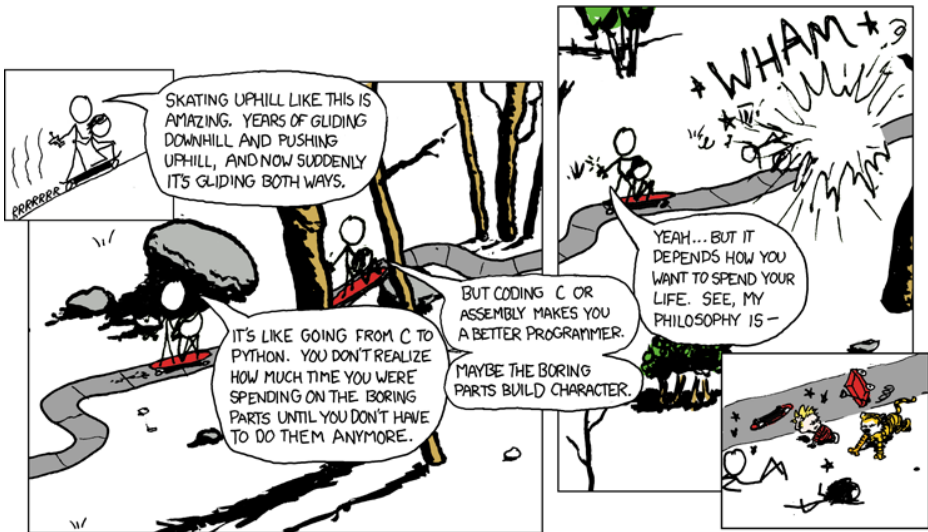
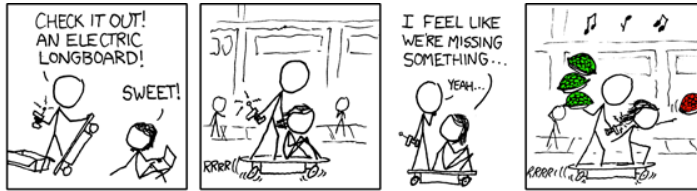
Explanation

Megan's sister has a crush on Cueball, but Cueball doesn't feel the same way about her sister. To alleviate the situation without hurting Megan's sister's feelings, Megan wants Cueball to deliberately take her sister out on a bad date to convince her that Cueball is not worth dating, so that her sister can move on without rejection. Cueball is excited to finally excel at dating badly. He claims to have been born for the task of giving a bad date. He promises to emulate one of his classic high school dates, indicating that they went terribly as well. The joke is based on the reversal of expectations and Cueball's subsequent excitement at the chance to provide a terrible date. Megan's response of "Oh God, don't overdo it" may also imply that she was one of Cueball's high school dates and doesn't want her sister to be subjected to what she remembers of Cueball's approach to relationships.

The title text implies that Randall is reflecting on previous bad dates. When they occurred, he had either no excuse or a poor excuse for why he was so awkward, but now "deliberately being mediocre" is going to be used as his explanation. It is similar to thinking of a good comeback to an insult after the fact; this is his retort to ships that sailed long ago.

#409: Electric Skateboard (Double Comic)

April 11, 2008



Unsafe vehicles, hills, and philosophy go hand in hand.

Explanation

This comic is an affectionate parody of Calvin and Hobbes, a newspaper comic drawn by Bill Watterson that ran for ten years from November 1985 to December 1995. Calvin and Hobbes follows the daily life of a rambunctious, precocious six-year-old named Calvin and his sarcastic stuffed tiger Hobbes. The artwork in the second strip is distinctly Wattersonian as well. This comic could be referencing the typical Sunday strip format of having a top line of "throwaway panels" that had a one-off gag before the rest of the strip, which was more detailed. This was an effect of Sunday strip formatting in newspapers, where individual newspaper often lopped off the top one-third of the comic to save space. Thus, strip creators had to use the top panels on throwaway gags or else the readers of a space-saving newspaper would be missing key parts of the strip.

Calvin and Hobbes is also referenced in 529: Sledding Discussion.

Randall has a special fascination with motorized skateboards. A longboard is a skateboard that is longer, used for downhill races, and skating through less urban areas (college campuses, for example).

Mario Kart is a game series for Nintendo game consoles that allows four players to race each other while having good spirited fun like at 290: Fucking Blue Shells while throwing items at each other. The objects in the fourth

panel are Koopa shells, items in the game. They can be thrown like projectiles to crash into foes: green in a straight line, red homing onto the racer directly in front. They also come in single and triple varieties. In Mario Kart: Double Dash!!, two racers occupy the same vehicle, with each possessing their own item slot (in contrast with most games in the series, in which a single vehicle can only have a single item ready, and must use it to obtain another). This is reflected in the drawing of Cueball and Megan together on the electric longboard, with Megan using a Red Shell and Cueball holding the triple Green Shells.

Calvin and Hobbes frequently involves heavy philosophical discussions. In one recurring theme, they ride down a dangerous hill in a red wagon or toboggan while discussing the nature of morality, usually ending in a crash (examples). This comic inverts that by having Cueball and Megan go uphill while discussing philosophy. Naturally, they collide with Calvin and Hobbes' wagon - which prompts the title text.

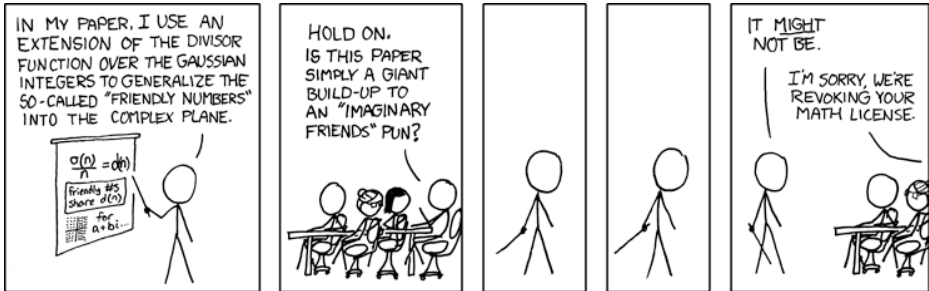
Cueball uses the C and Python programming languages as analogies for their ride. In general, Python is easier than C and abstracts a lot of C's hairier features ("boring parts," as Randall calls them). Moving from C to Python is quite a freeing experience; programmers no longer have to worry about pointers and memory allocation, and it just lets the code flow through the programmer until they are one with the Force. Erm, computer. Although, it seems that - before the crash - the idea that programming in C (and skating without electricity) building character

is about to be explored philosophically (building character is also a recurring theme in Calvin and Hobbes, as documented delightfully in the Calvin and Hobbes wiki).

Electric skateboards have been the subject of several other comics like 139: I Have Owned Two Electric Skateboards, a panel in 442: xkcd Loves the Discovery Channel, and the entire The Race five part comic series.

#410: Math Paper

April 14, 2008



That's nothing. I once lost my genetics, rocketry, and stripping licenses in a single incident.

Explanation

The math paper Cueball is in the process of describing in this comic turns out to be nothing but an elaborate setup for a joke about imaginary friends by taking the concept of "friendly numbers" into the complex (imaginary) plane, which comprises complex numbers that have both a real and an imaginary part (see details below).

Cueball is challenged on this setup by his superiors, specifically the Cueball-like guy sitting at the end of the table, who look straight through his first line-up for the joke, and ask him directly if this is just a build-up for this joke. Cueball tries at first to look like he has no idea what he's talking about, then lowers his head, in shame, and finally tries to state that it might not be such a setup. But it is too late now.

Such a pun is both so obvious and so terrible that Cueball's superiors deem that he should no longer have a license to math, and they thus revoke Cueball's "math license." Of course you do not need a math license,[citation needed] but that is part of the comic's concept along the lines mentioned here below and further elaborated in the title text.

It is a recurring theme in earlier xkcd comics that Cueball (or Randall) ends up being banned from holding presentations at conferences after a presentation turns out to be just an elaborate pun.

The title text takes the joke a step further, with the added hilarity of making the audience question exactly how Cueball/Randall was able to work a striptease into a presentation about genetic engineering and astrophysical rocket study (or possibly genetics and rockets into a striptease), and then even manage to lose all three licenses in one go. This is what TV Tropes calls a "noodle incident."

The whole comic is basically Randall making the joke that Cueball never got around to, but packing it up so we think it is about something else. Randall has often made such feeble jokes, but by putting them into a context where someone listening may comment on how bad that joke is or have to explain the joke, it somehow becomes alright, and he can get away with these jokes anyway. (See for instance 18: Snapple).

Math[edit]

An imaginary number is a number that can be written as a real number multiplied by the imaginary unit i , which is defined by its property $i^2 = -1$ (an impossibility for regular, "real numbers," for which all squares are positive). The name "imaginary number" was coined in the 17th century as a derogatory term, since such numbers were regarded by some as fictitious or useless, but over time, many applications in science and engineering have been found.

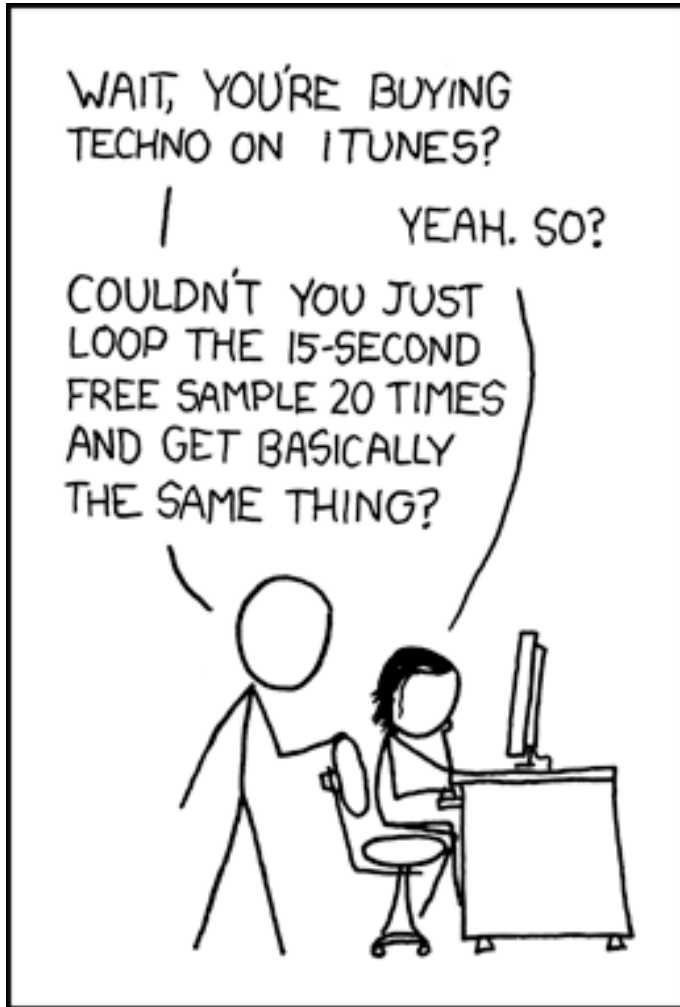
An imaginary number bi can be added to a real number a to form a complex number of the form $a + bi$ (the formula shown at the bottom of Cueball's slide), where a and b are called, respectively,

the real part and the imaginary part of the complex number. If a and b are both integers, the complex number is called a Gaussian integer (as Cueball mentions). The complex plane is an X-Y plot with a on the X axis and b on the Y axis. (Such a plane is shown at the bottom of Cueball's slide).

Joel Bradbury (once) had the below cited and wonderful explanation of friendly numbers on his site:

#411: Techno

April 16, 2008



I don't know what's worse -- that there exists broken-hard-drive-sound techno, or that it's not half bad.

Explanation

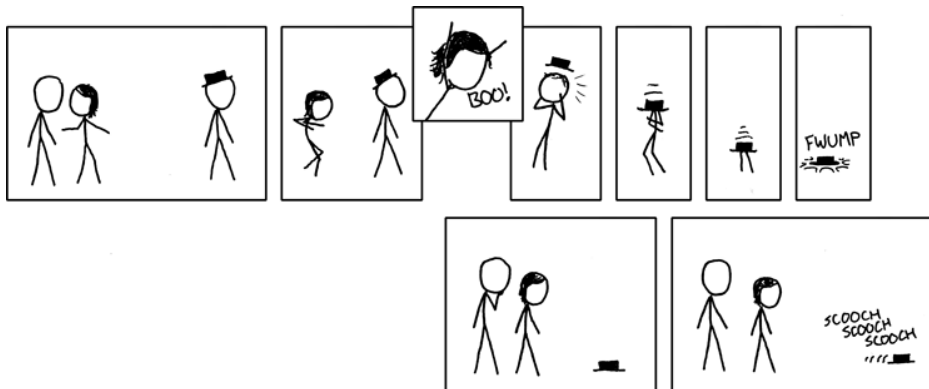
Cueball points out that due to the repetitive nature of techno music, the iTunes 15 second sample can be used to recreate the entire song. This is for the many repetitions in techno music, usually repeating it 4 (or other powers of two) times.

The title text refers to the clicking and grinding noises of a dying hard drive, a sound similar to some techno songs. The title text suggests that this actually exists.

Techno music is also mentioned in 586: Mission to Culture and 740: The Tell-Tale Beat. Sampling and looping sounds that aren't necessarily musical is mentioned in 2427: Perseverance Microphones.

#412: Startled

April 18, 2008



...

Explanation

Black Hat, the cool-headed troll, has the tables turned on him. Almost always seen antagonizing other characters, Black Hat is shown in this comic in a rare moment of losing face. Megan notices Black Hat facing away from Cueball and her, and decides to play a simple, childish prank on him: sneaking up from behind and shouting "Boo!".

She succeeds in startling Black Hat. Most likely out of humiliation, he hides himself completely in his hat. For a moment, it looks like Black Hat has disappeared altogether. But then his hat inches away, showing that he's still underneath. It is possible that he was set on edge by Danish, as the period from Journals 3-4 was clearly an emotional time for him.

Both gags in this comic work by playing on our expectations. The first is an unexpected moment of realism: we are so used to seeing Black Hat cool and untroubled that we are surprised at the reminder that everyone's appearance is, to some extent, a facade. Black Hat is still human. (The comic 455: Hats is related to this one, as it is also about black hats and how the usually all powerful Black Hat becomes the smaller one, in this case in tallness of hat towers.)

Another interpretation of this comic is that it is Black hat's backstory, implying that it is set in March 1997, but this is unlikely given that we see him as a classhole still

when he was just a child in 1139: Rubber and Glue and 1753: Thumb War.

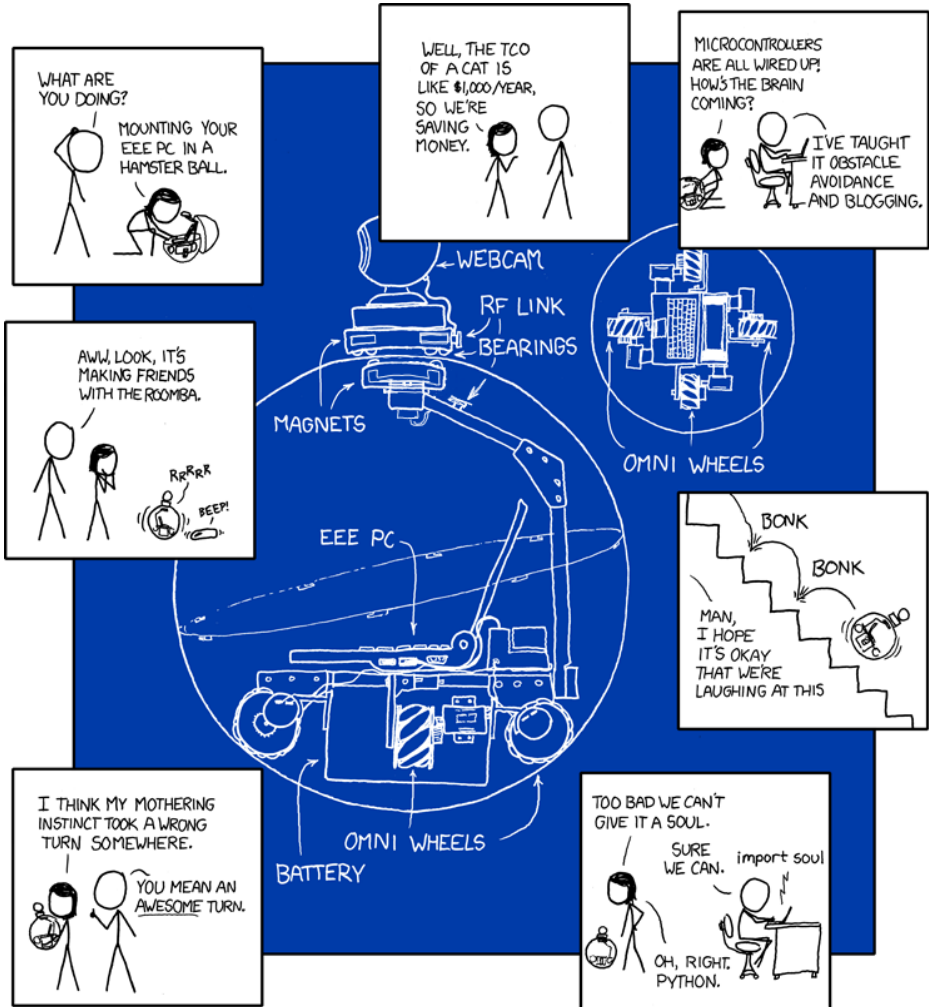
The second gag, on the other hand, is the opposite: we are so used to understanding the stick figures (and specifically the established character that is Black Hat) as representing regular humans, albeit ones with larger-than-life personalities, that we're caught by surprise to see Black Hat so thoroughly defy realism in a fashion not unlike what one could find in a Tex Avery-type cartoon. Among the further interpretations of the gag, one could see:

- a literal interpretation of a stick figure, with minimal volume, folding up into a hat, thus defying the readers' habit of seeing the stick figures as representations of real humans of flesh and blood;
- a joke on Black Hat's nickname, as the nicknamed "reduces him to his black hat," which is what Black Hat literally does to himself;
- a suggestion that Black Hat is an otherworldly being running more on his own fancies than the laws of reality (which would explain how he pulls off many of the things he does, and is backed up by 2174: First News Memory, where it shows that he isn't actually from this planet). This interpretation is rendered all the more likely by the fact that Cueball's and Megan's reactions make it clear that Black Hat's actions should not be possible in the world of the comic as they understand it.

The title text is only "...", implying that Randall himself shares the reaction of Cueball and Megan, who are left speechless and immobile in the last panels, as Black Hat completes his physics-defying stunt. The same title text is used in 82: Frame and 455: Hats. One could say of these comics that they're somewhat surreal, and any further commentary might have detrimentally brought them down to Earth.

#413: New Pet

April 21, 2008



ONE LAPTOP PER HAMSTER!

Explanation

Megan and Cueball create a new pet by putting an Eee PC into a hamster ball, allowing it to roll around.

The Asus Eee PC was one of the first subnotebook computers available on the American market, noted for its small size and coming pre-installed with Linux. With a diagonal size of 11 inches, it would take a big hamster ball to carry it like this.

Omniwheels are wheels with rollers mounted on the edge to allow the wheel to slide sideways. The wheels in the drawing look more like Mecanum wheels, which have rollers mounted at an angle to the edge. Both omniwheels and Mecanum wheels are used in omni-directional drive systems, like you would use to drive a hamster ball from the inside. A webcam is connected magnetically to the top of the hamster ball, which connects to an rf link to transmit wirelessly to the computer.

TCO is total cost of ownership, which is exactly what it sounds like: the purchase price of something, plus all costs of keeping, operating, and/or maintaining that something. It's used in accounting to determine something's true cost-to-value evaluation. In the case of a cat, TCO would primarily consist of food, litter, veterinary care, etc. Refer to trivia for more details. For the device in the comic, there would be a small ongoing cost (occasional recharges for the batteries) after the initial investment.

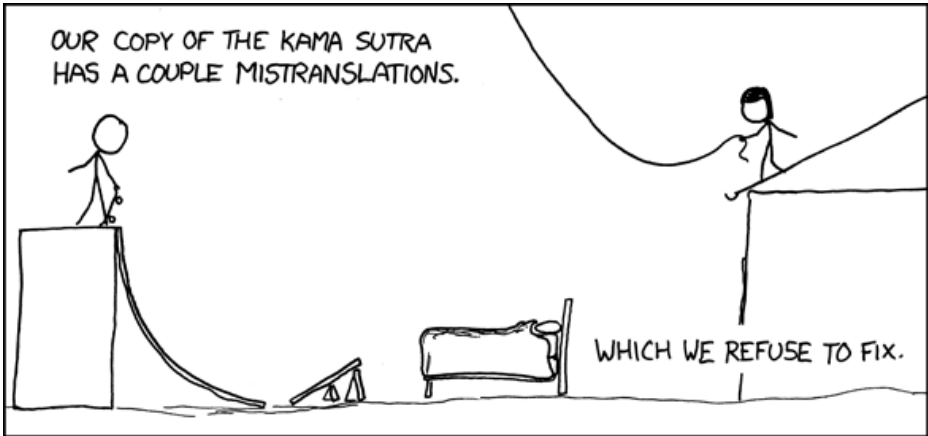
A Roomba is a self-directed robotic vacuum cleaner made by iRobot, which has no feelings and cannot make friends.[citation needed]

Python is a programming language popular among geeks running Linux. Among other features, it has a large number of easily installed 3rd-party libraries that make it easy to add features (stored in modules) to programs. In this case, Cueball is importing the (fictional)[citation needed] soul module to give the new pet a soul. This is a reference to 353: Python, in which Cueball is able to fly by importing the (then fictional) antigravity module.

The title text refers to the One Laptop per Child project spearheaded by Nicholas Negroponte around 2005, with the goal of building an inexpensive, durable sublaptop that could be distributed to children in developing countries to give them an educational edge.

#414: Mistranslations

April 23, 2008



Oh, I think this word might mean 'Crisco'!

Explanation

The Kama Sutra is a well-known work on human sexual behavior originally written in the language Sanskrit, in India sometime between 400 BCE and 200 CE. It's not exclusively a "sex manual," as it also contains a guide to virtuous and gracious living, but in the Western world, it's primarily thought of as a manual of exotic sex positions.

Given that the Kama Sutra was written almost 2,000 years ago, it's doubtful that it has any references whatsoever to a skateboard ramp, but Cueball and Megan enjoy their badly-translated version of the Kama Sutra so much that they refuse to change it.

The title text refers to Crisco, a brand of shortening that is used in baking, as well as a sexual lubricant. It has been mentioned before in 330: Indecision and later in 557: Students.

#415: Restraining Order

April 25, 2008



On Mondays I go running, so you'll have to get up early and follow along on a parallel street. What fun!

Explanation

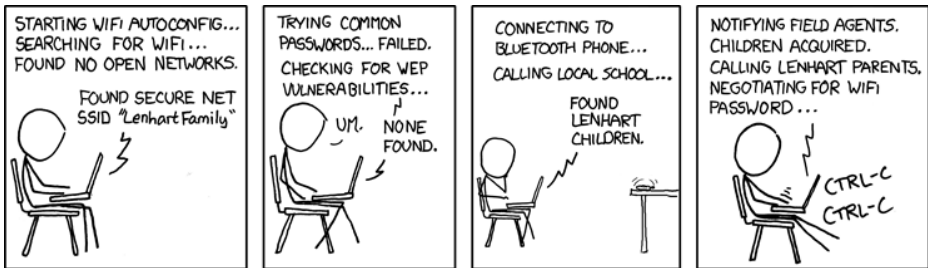
A restraining order is a legal injunction requiring a party to do, or refrain from doing, certain acts under penalty of fines or imprisonment, designed to safeguard the complainant's life. In general, the forbidden act is virtually always contacting the complainant in any way and enforcing that they remain a minimum distance from the complainant.

However, Ponytail has taken the concept into the realm of the absurd, issuing a restraining order against Cueball that requires him to stay between 500 yards (~457 m) and 600 yards (~549 m) of her at all times. Needless to say, this will cause a major disruption to his life; the title text gives an example in which he is forced to imitate her jogging routine just to avoid breaking the order. What isn't explained is how Cueball can possibly keep himself within the ring if she happens to travel by airplane or ferry. This, and because there are virtually no useful scenarios for it,[citation needed] is why maximum distances are never enforced in real life; such an order would grant the complainant carte blanche to unjustly manipulate the defendant.

A yard is a unit of length used in the UK and the United States. 1 yard = 0.9144 meters, or 3 feet.

#416: Zealous Autoconfig

April 28, 2008



I hear this is an option in the latest Ubuntu release.

Explanation

Cueball is seen in an attempt to connect his laptop to a Wi-Fi network using, as the comic title suggests, a particularly zealous "Wifi Autoconfig" utility — "zealous" being a synonym for "eager" or "enthusiastic." The utility manages to find a secure access point named "Lenhart Family," presumably Miss Lenhart's home Wi-Fi access point, and attempts to connect to it.

Instead of requesting a password, the program automatically begins a dictionary attack, entering in various commonly-used passwords in the hopes that Miss Lenhart has little regard for proper security measures (a flaw shared by many computer users). When this fails, the program attempts to exploit a WEP vulnerability, which surprises Cueball. This also fails, possibly because Miss Lenhart used WPA instead of WEP.

In the third panel, the autoconfig then connects to Cueball's Bluetooth phone and uses it to call a local school in order to locate the Lenhart children, who are attending there, and it reports that it has found them. It acts on this information in the fourth panel, notifying "field agents" to kidnap the Lenhart children for nonmonetary ransom, and then reports that the children are acquired (very fast it seems). With the children as hostages, the program begins negotiations with the parents, offering their safe return in exchange for the Wi-Fi password.

This puns on the computing sense of "negotiation": network protocols (such as HTTP) often specify routines whereby a server and a client computer can agree on the best format in which data can be transferred. This is called content negotiation or format negotiation (see for example section 3.4 of the specification for "semantics and content" in HTTP).

Cueball, frightened by these actions, repeatedly presses Ctrl+C in an attempt to cancel the process, with little success. Ctrl+C is used to abort programs started from a terminal (Unix/Linux) or a command line prompt (cmd.exe under Windows). (The alternative use of Ctrl+C in many programs, as a shortcut for copying a text selection, is probably not what Cueball has in mind at this point.) Part of the humor is that he only attempts to cancel quite late in the process, well after (for instance) the school was first called, probably because of a morbid curiosity to see what happens.

The title text mentions Ubuntu, a Linux distribution that attempts to be as user-friendly as possible. Randall mentions that he has heard that this "user-friendly" Zealous Autoconfig option has already been installed in the latest Ubuntu release.

Problems that arise when you leave decisions to a computer program are also explored in depth in comic 1619: Watson Medical Algorithm.

#417: The Man Who Fell Sideways

April 30, 2008



Strip originally conceived in conversation with Jeph Jacques. Soon to be a major motion picture.

Explanation

This comic is humorously built-up like a short drama story, about a man (Cueball) with an unusual physics condition.

It might have been inspired by the Uncle Scrooge adventure comic "A Matter of Some Gravity" (Inducks) by Don Rosa, in which Magica de Spell makes gravity pull sideways at Scrooge McDuck and Donald Duck.

The same topic is covered by 1996 graphic novel *L'enfant penchée* (The Leaning Child), but, as it was only published in English in 2014, it's very unlikely to be a source of inspiration for this comic.

"Soon to be a major motion picture" in the title text might refer to *The Curious Case of Benjamin Button*, a film released later in 2008 (and based on a short story), in which the protagonist Benjamin suffers of the impossible condition of aging backwards.

"Over land... and sea" might be from the song "Nature Boy" by eden ahbez. Nat King Cole sung (the most famous version) about "A very strange, enchanted boy. They say he wandered very far, very far over land and sea."

The title text mentions Jeph Jacques, who runs the webcomic *Questionable Content*. Jeph has also described the creation of this comic in his blog (archived) while working at ezplay company.

When Cueball hits Megan, he knocks her down and "knocks her up", in what is probably intended to be a visual form of antanaclasis. Megan tells Hairy about a person knocking her over and tumbling into the distance. She hints that she is falling for him, which is a joke regarding Cueball's condition.

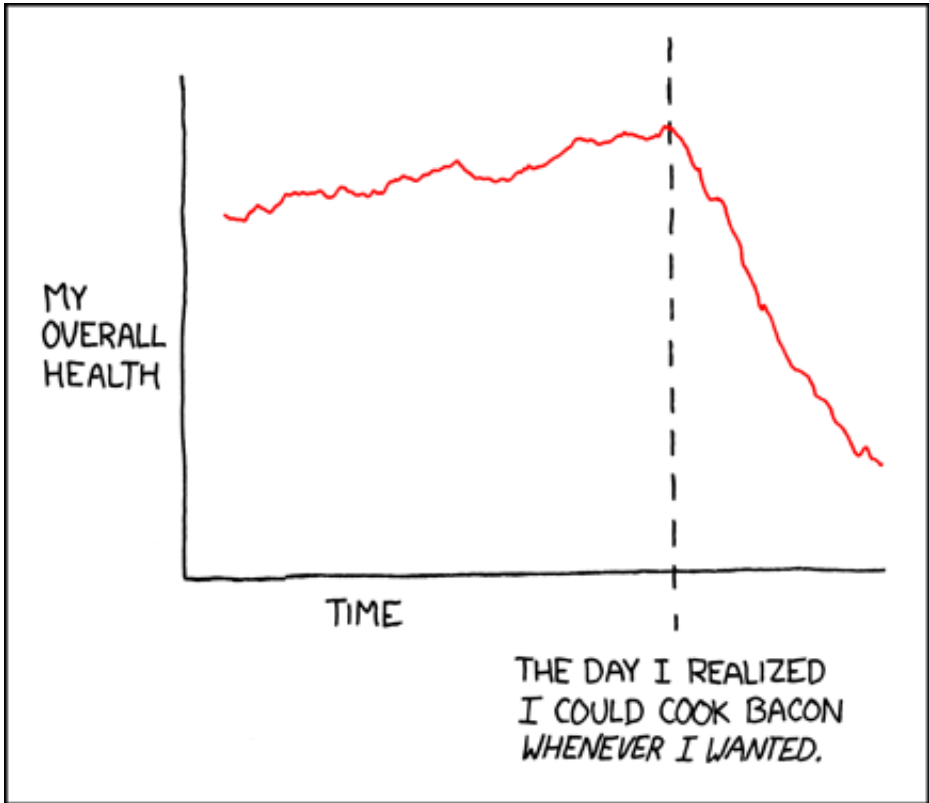
The baby shares his tendency to be pulled sideways by gravity, but this apparently does not start until she is born, because Megan and the doctor do not seem to have been expecting it. If gravity had affected the unborn fetus in the same way, Megan would have been able to feel it, would have noticed that her uterus was hanging differently, and would have had difficulty balancing due to the sideways forces.

The last panel is a reference to the opening scene of *The Lion King*, called 'The Circle Of Life'.

The first part of the comic has some resemblance to this much later comic: 1376: Jump.

#418: Stove Ownership

May 02, 2008



Although maybe it's just a phase, like freshman year of college when I realized I could just buy frosting in a can.

Explanation

This comic is a subtle statement on the epiphany many have when they reach adulthood and are on their own for the first time: No one will tell you what to do! Nobody will, however, stop you from making those poor decisions you were restrained from prior to that independence. Eating bacon whenever one wants is among them.

This line graph depicts Randall's health as a function of time after some undefined point. The joke is that his health goes into an immediate deterioration the moment he realizes that he could just cook bacon on his stove whenever he wants. When he says "he could cook bacon," he means he has both the will AND means, since the stove is now his own. Before the bacon revelation, his health was actually improving - this may be explained because he was now cooking his own, healthy food rather than getting pizza delivered or having other pre-made foods/junk food.

Frosting (or icing) is something you use to decorate cakes. Many children enjoy frosting so much that they eat it off the cake and leave the rest behind. Frosting in a can, as mentioned in a title text, is convenient because it is instant and not necessary to make from scratch. When Randall came to college, he still had a very sweet tooth, so when he discovered frosting in a can, his health curve at the time also went into decline. However, that turned out to be a phase - he got over it - and he hopes it will be

the same with cooking bacon.

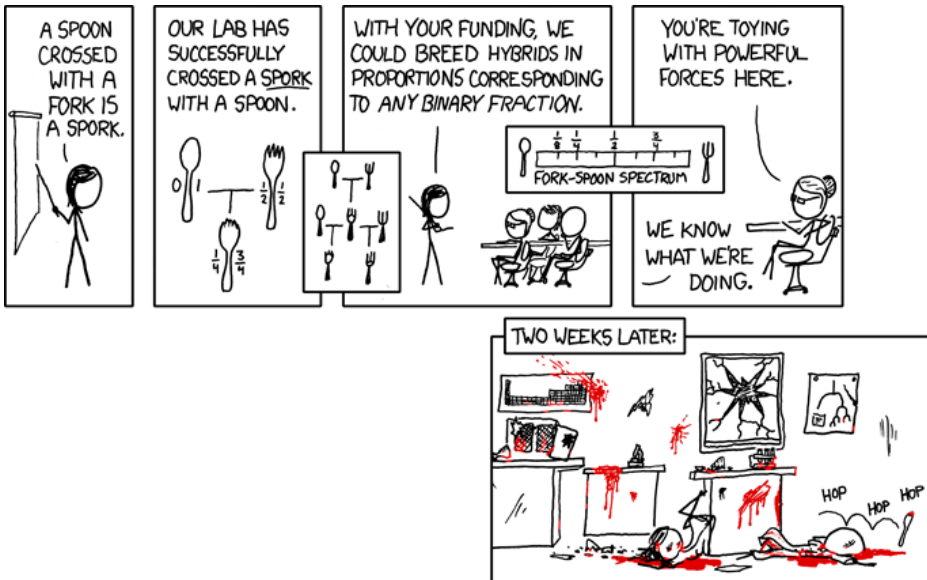
There is now also similarly instant, pre-cooked bacon that can be eaten right out of the box, eliminating the need to put in any effort to prepare it. The sudden drop in health, obviously, is due to the fact that most bacon is pork belly fat, and while high in protein, its irresistible flavor cannot compensate for its high fat and cholesterol content.[citation needed] In addition, porkless bacon made from turkey meat is also available in some places.

In the title text of 1674: Adult, it turned out that Cueball was not yet ready to go shopping by himself, even though he was an "adult" and ended up dying of over-consumption of AirHeads, very similar to the frosting in this comic's title text.

Eating frosting out of the can was also referenced in the title text of 1793: Soda Sugar Comparisons.

#419: Forks and Spoons

May 05, 2008



Their biggest mistake was bringing Rachael Ray and Emeril to tour the lab and sign off on the project. That's when Spielberg caught wind of it.

Explanation

The comic shows scientists testing a new technology to blend species.

They show that their new technology allows them to cross a spork (an even mix between a spoon and a fork) with a spoon to make a new implement that is three-quarters spoon and one-quarter fork. By blending these new fork-spork hybrids and their results together, the scientists could create any mix between a spoon and a fork. (Obviously, regular genetics cannot apply to non-living items such as metal cutlery.)[citation needed]

In the second panel, the amounts of spoon and fork are shown with fractions: the number on the left representing the amount of fork, and the right the amount of spoon. The numbers for the cross product below are arrived at by summing each side and dividing by two: $(0+1/2)/2 = 1/4$ and $(1+1/2)/2 = 3/4$.

The breeding scheme between the second and the third panel shows at the top how to create a spork from a spoon and a fork, then how this spork could both be bred with either a spoon (as in panel two) or a fork (as shown in the lower right part).

The binary "fork-spoon spectrum" in between the third and fourth panels shows the complete spectrum of sporks from fork to spoon with some of the intermediate steps labeled, the numbers representing how much fork

each contains. Since it is a binary spectrum, only fractions with a denominator that is a power of 2 will be possible, i.e. 2^n with n any integer. So in the middle is a spork with $1/2$ fork, in between the spork and the spoon there is only $1/4$ fork, and in between that and the spoon only $1/8$ fork, and so on. Also $3/4$ fork is marked, whereas $3/8$, $5/8$, and $7/8$ fork is only indicated on the ruler by small marks. For instance, they could breed a $3/8$ fork-spork by mixing a $1/4$ fork-spork with a spork (or, if they already have them, a $1/8$ th version with a $5/8$ th version, or a $3/16$ th with a $9/16$ th; it can be shown that any two values of the form $n/2^m$, where n and m are integers, will have a midpoint also of that form, and there are an arbitrary number of ways to reach the latter, although you could constrain yourself to only crossing pairs that produce a result which must be expressed with values of m greater than either of the 'parents' require). In mathematics, the set of "binary fractions" is called the set of dyadic fractions.

The comic begins like standard sci-fi fare, where amoral scientists request funding from mysterious benefactors. The dialogue of "You're toying with powerful forces here" and "We know what we're doing" is a classic trope, foreshadowing that things will soon go horribly wrong. It inevitably leads to the humorous incongruity of a sentient spoon-fork-hybrid on a murderous rampage, which is impossible in real life.[citation needed]

Rachael Ray and Emeril, mentioned in the title text, are celebrity chefs, and Steven Spielberg is a famous movie director. The joke seems to be that if the laboratory

hadn't hired the two renowned chefs, Spielberg wouldn't have heard about the project and would not have made a movie about it - in which the two scientists are killed off horribly (it is probably the scientist from the first panel, Megan, and her friend, Cueball, or the actors hired to portray them in the film). The plot in the comic is very similar to the story in Spielberg's Jurassic Park.

#420: Jealousy

May 07, 2008

MEGAN AND I FIRST MET AT
A PARTY AT HER SISTER'S.

WE HIT IT OFF, OPENED UP, SHARED SECRETS, AND
TALKED ABOUT EVERYTHING. AROUND US, THE PARTY
WANED, BUT WE HID FROM SLEEP TOGETHER, TALKING
THROUGH THE DEEPEST HOURS OF THE NIGHT.



THE DAWN FOUND US CURLED UP ON
A COUCH, ASLEEP BUT STILL TOGETHER.

THAT EXPERIENCE, CONNECTING WITH A
STRANGER AND FALLING RECKLESSLY IN
LOVE, IS ONE OF LIFE'S GREATEST JOYS.

AND NOW THAT YOU'RE MARRIED,
YOU'LL NEVER EXPERIENCE IT AGAIN.

IT'S THE PRICE YOU PAY FOR EVERLASTING LOVE.
IT'S A SMALL ONE, BUT I HOPE IT STINGS A LITTLE.

ANYWAY, I WISH YOU AND MEGAN THE BEST.
...HEY, MAN, YOU ASKED ME TO DO A TOAST.

Oh, huh, so you didn't know that story?

Explanation

In the first four stanzas of this soliloquy, Cueball reminisces fondly about his meeting of Megan at a party where they quickly had a romantic rapport and spent the night together. The next two stanzas are a lamentation that Megan is now married and can never have that same experience again.

The final stanza reveals that this is not merely Cueball waxing poetic about a previous love, but that he is actually making a toast as the best man at Megan's wedding reception - certainly an occasion when it is wildly inappropriate to discuss the previous romantic involvements of the bride. In modern times, it is not unexpected that the bride at a wedding will have had previous relationships with someone other than the groom, but a wedding is no time to mention them.[citation needed]

The title text implies that the groom had no prior knowledge of Cueball's and Megan's dalliance, and therefore the toast is even more inappropriate - going beyond discussing the previous romantic history of the bride, to actually revealing previously unknown such history to the groom.

Presumably, Cueball's having been selected to be best man indicates that he is a good friend of the groom (as the groom normally selects the best man). The title hints that Cueball is envious of the groom, since his previous

encounter with Megan clearly did not result in a lasting relationship, while the groom's clearly did. This suggests that he may be intentionally (perhaps drunkenly) making an inappropriate toast to embarrass the couple as a result of his bitterness.

This was only the third time the name Megan was used in xkcd, the first time being in 159: Boombox.

#421: Making Hash Browns

May 09, 2008



There are at least fourteen ways this could go badly
(seventeen if that fork is a dangerous crossbreed.)

Explanation

Cueball is either attempting to make hash browns or french fries. Both methods are ways of serving a potato where the potato has been diced or shredded in some way, then pan-fried (or, in the case of fries, more commonly deep fried. Cueball's method for making hash browns, though, is rather unique. He is throwing potatoes into the air and striking them with a flaming tennis racket at his friend, who is holding a tray with a dangerously tilting half-empty glass balanced on top. The friend is also holding a fork in the other hand.

The idea is that the tennis racket would simultaneously dice the potato, fry it, and then launch the completed product towards his friend's plate. In reality, this probably wouldn't do much. To properly pan-fry food, it must be cooked in a pan with some oil to lubricate the food, with enough time for the heat to transfer through the oil and spread properly through the food. Hitting a potato with a flaming tennis racket would not cook it, as it would strike it too quickly, and it probably wouldn't dice it either unless the wire of the racket is incredibly sharp. Cueball would probably just end up batting a not even hot, uncooked, unprepared potato at his friend, while simultaneously burning his own hand. In the case that the wires did actually cut through the potato, then the potato would not be moved forward, but actually end up behind the racket.

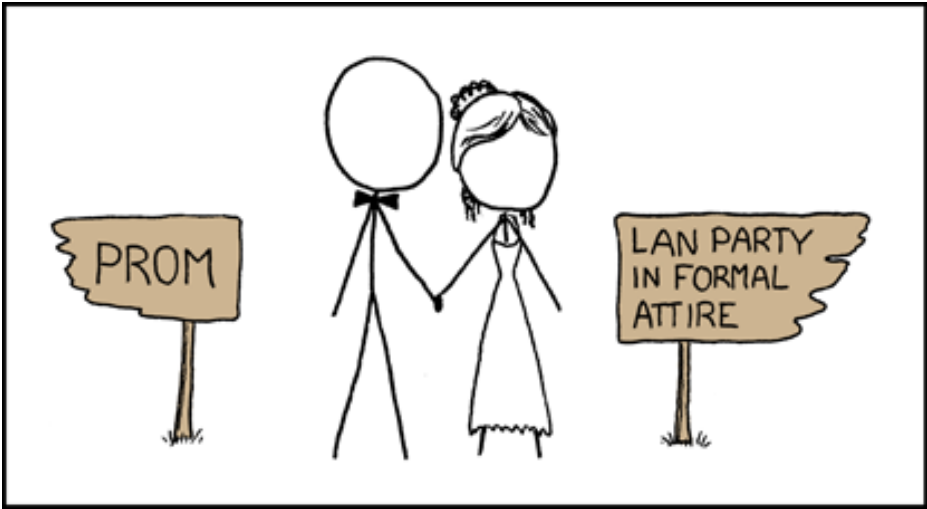
The title text comments on how many ways this

experiment could go badly (14), and jokes that there are even more potential problems (17) if the fork Cueball's friend is holding is a cross-breed. (See 419: Forks and Spoons, which was published only four days earlier. By reading this comic, it should be clear what could go wrong if they were included in the equation - 3 more ways would be a low estimate....)

It's unclear what Randall may or may not have had on his mind with regards to specific ways the situation in the comic could go wrong. But here are several potential ways the activity could go wrong without including Sporks:

#422: A Better Idea

May 12, 2008



It's **almost** enough to make me want to redo high school.

Explanation

In the United States, a prom (short for promenade) is a semi-formal (black tie) dance or gathering of high school students. They normally are awkward experiences for nerdy people.

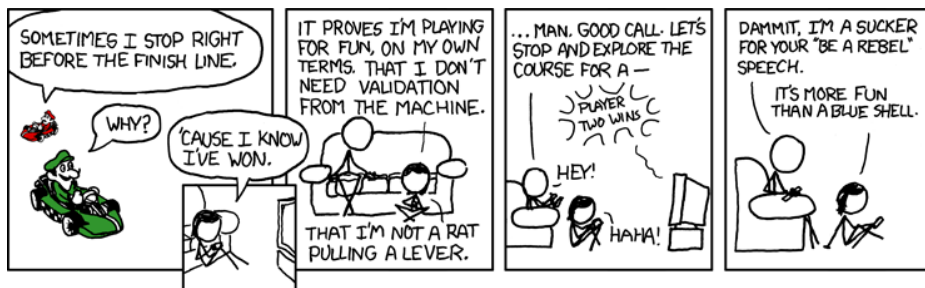
A LAN party is a temporary gathering of people with computers or game consoles, between which they establish a local area network (LAN), primarily for the purpose of playing multiplayer video games. They are normally very informal.

Cueball and Megan are likely going to prom together, but they stop when they see that there's a LAN party in formal attire, meaning they wouldn't be out of place. The comic title is likely what one or both of them would say in this situation, since the LAN party is probably much more appealing than a formal ball to them.

The title text indicates that Randall would have loved for such a thing to be possible, so much that he very nearly would redo high school just to participate.

#423: Finish Line

May 14, 2008



The question with Lucy and the football was always whether, on some level, she believed the things she said.

Explanation

Cueball and Megan are playing Mario Kart, with Cueball's Luigi character ahead of Megan's Mario towards the end of the race. Megan begins waxing philosophically on how she sometimes stops right before the Finish line (hence the title), because she knows that she has already won and then does not need the machine to tell her so. She says it proves she doesn't act like a rat going through a laboratory maze in pursuit of cheese.

This talk makes Cueball realize that winning a video game isn't really important, and how by speeding through a racing level like the game asks you to do, you sometimes miss the fun of simply exploring the level and enjoying the extraordinary level of detail and work that went into it. He thus exclaims that it was a good call and slows down - expecting Megan to join him exploring.

In the end, it was just a ruse by Megan, who speeds past him and wins, much to her glee. "It's more fun than a blue shell," she says, referring to the Mario Kart item that, when fired, will inevitably hit the race leader and cause him to crash. Randall has rather adamantly expressed his opinion about blue shells before in 290: *Fucking Blue Shells*.

Cueball's response suggests that he has been fooled before by Megan's *Be a rebel* speech - something she can pull off against him again and again. This leads to the subject of the title text.

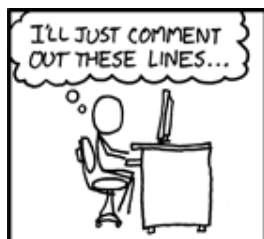
Note: In MKWii, people sometimes troll others by stopping right at the finish line. When the person behind them gets close, they cross the line and cause 2nd place to lose, psychologically messing with them by giving them a false hope.

The title text refers to the comic strip Peanuts, and the running gag where fussy Lucy would hold an American football for lovable loser Charlie Brown, and he'd come running at it full speed, only to have Lucy pull the football away at the last moment and send Charlie Brown crashing to the ground. What made it funny was that each time, Lucy would find some way to convince Charlie Brown that this time, she wouldn't pull the football away, and he'd try again — but lo and behold, of course she did. (See example of this, in the collection of moments shown in the very last Peanuts comic).

The title text asks the important question if Lucy believed the things she said - even if she would eventually pull the ball away. If so, it would be easier to fool Charlie Brown. Maybe Cueball suggests that Megan believes what she says up to the point where she wins....

#424: Security Holes

May 16, 2008



IN THE RUSH TO CLEAN UP THE DEBIAN-OPENSSL FIASCO, A NUMBER OF OTHER MAJOR SECURITY HOLES HAVE BEEN UNCOVERED:



AFFECTED
SYSTEM

SECURITY PROBLEM

FEDORA CORE	VULNERABLE TO CERTAIN DECODER RINGS
XANDROS (EEE PC)	GIVES ROOT ACCESS IF ASKED IN STERN VOICE
GENTOO	VULNERABLE TO FLATTERY
OLPC OS	VULNERABLE TO JEFF GOLDBLUM'S POWERBOOK
SLACKWARE	GIVES ROOT ACCESS IF USER SAYS ELVISH WORD FOR "FRIEND"
UBUNTU	TURNS OUT DISTRO IS ACTUALLY JUST WINDOWS VISTA WITH A FEW CUSTOM THEMES



True story: I had to try several times to upload this comic because my ssh key was blacklisted.

Explanation

The "Debian-OpenSSL fiasco" was a major security problem discovered in the Debian Linux distribution and its version of the cryptographic library called OpenSSL. With just a tiny change in the software, which was intended to have no effect on security, its random number generator was completely crippled, as was the security of all cryptographic keys generated by the system. The problem was created when a Debian developer removed one line of code that was crucial, even though it could seem like it did nothing useful. More detail about the fiasco: [Crippling Crypto: The Debian OpenSSL Debacle](#), [Debian's information page about the problem](#).

The title text refers also to this issue: After the security problem was found, all cryptographic keys generated or used on the broken operating system needed to be replaced. Many systems introduced special checks for such weak keys, adding the keys to blacklists, thereby preventing their use and forcing users to create new keys. Randall claims that he was affected by that when uploading this comic to the server.

The panels on the left present Cueball as a programmer who, on a whim, removes pieces of code, (commenting out the code by prepending the line with two slashes), presumably thinking that they are not necessary. The first removed line, `MD_update(&m, buf, j);`, is the exact piece of code that was removed in the Debian fiasco. The

next panels show him commenting out fictitious lines of code apparently preventing bad things from happening.

The other part of the comic lists "security problems" that were allegedly discovered in other Linux variants afterwards:

Cryptographic software in Fedora Core was allegedly not secure against toy decoder rings. This is probably a reference to the association of the fedora with 1930s and 40s culture (especially gangsters and film noir), and the contemporaneous introduction and popularity of toy decoder rings.

Xandros (used in Asus Eee PC netbooks) gave superuser privileges to anybody "if asked in a stern voice." This is likely a reference to the fact that the preinstalled Xandros OS did not require a password for root privileges by default.

Gentoo would succumb to flattery, which may be a reference to Gentoo's notorious difficulty to manage. Any user who is capable of understanding it might have a large ego, and therefore be susceptible to flattery.

OLPC OS could have been attacked using Jeff Goldblum's laptop computer, which refers to a scene in the Independence Day movie, where Jeff Goldblum's character was able to hack into an alien spaceship using his Apple PowerBook computer - which is a topic of great contempt by geeks who point to the absurdity of such a construction.

Slackware gave superuser privileges to anybody who "says Elvish word for 'friend'," which refers to a scene in *The Lord of the Rings*, where the entrance door to Moria could have been opened using a password *mellon*, the Elvish word for "friend," as indicated on the door itself. Another reference to this is in 1218: *Doors of Durin*.

And Ubuntu, which is another Linux distribution, was allegedly found to be actually Windows Vista, the latest version of Microsoft Windows at this time in 2008. This may be a reference to Ubuntu being developed with non-advanced users in mind, with many fail-safes and additional features being turned on by default, which had more in common with Windows than any other Linux-based operating system at the time.

#425: Fortune Cookies

May 19, 2008



'You will have hot, steamy, sweaty sex ... **IN BED!**'

Explanation

Fortune cookies are crisp cookies containing a small piece of paper with words of wisdom or a vague prophecy. Even though they were not actually invented in China, they are commonly served as dessert in Chinese restaurants in the United States.

There is a common joke involving fortune cookies that involves appending "in bed" — the phrase "in bed" being one of many sexual innuendo jokes along with "your mom," "that's what she said," and "said the actress to the bishop" — to the end of the fortune, usually creating a sexual innuendo or other bizarre messages.

- The ones you love will never let you down in bed
- Your self-confidence is well placed in bed
- Seek nonviolence in everything you do in bed

This comic turns that joke around, showing how appending "except in bed" can also create even more amusing messages.

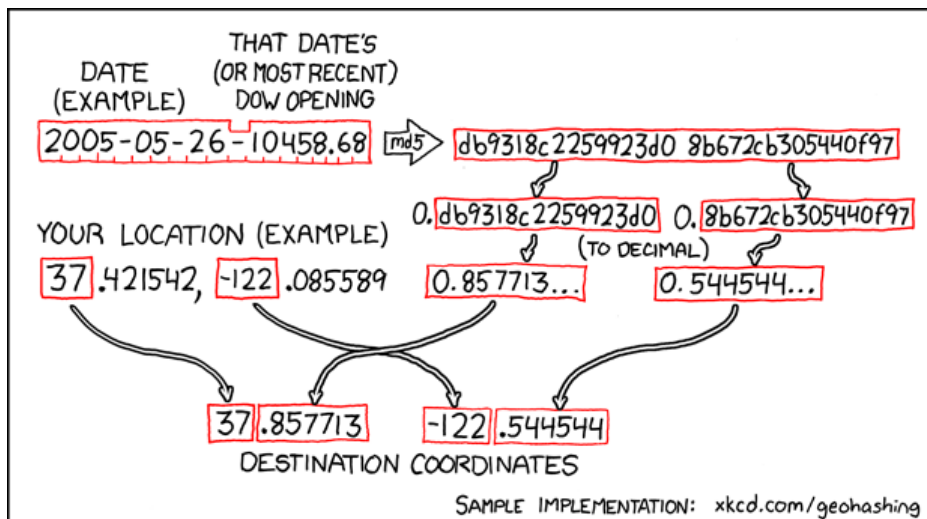
- The ones you love will never let you down, except in bed
- Your self-confidence is well placed, except in bed
- Seek nonviolence in everything you do, except in bed

The title text instead shows the example of an imaginary fortune that would not change in meaning if "in bed" was appended. The meaning would, however, change

considerably if except in bed was added instead. A part of the joke is that you will never find such a fortune in a cookie!

#426: Geohashing

May 21, 2008



Saturday is game night.

Explanation

Geocaching is a sport where you have to find things hidden by other people based on geographical coordinates. Randall has had a similar idea before in 201: Christmas GPS.

Geohashing is a sport created by Randall based on reaching a random location determined by an algorithm that uses a hash function that involves the current date, location, and the Dow opening price. The Dow Jones Industrial Average is a stock market index dealt in New York City.

The algorithm is built in a way that:

- Makes it impossible to plan a meeting in advance of more than a few days and usually not more than a day.

This is due to incorporation of the Dow opening as seed - there isn't a new value of the seed every day since the Dow doesn't open on weekends or holidays, but there is for most days. The reason Saturday is mentioned in the title-text is that the coordinates for that day are generated using Friday's open, giving a greater number of hours to plan the 4 PM local time meetup (how many depends on the time zone(s) of the graticule, hence the '30W' rule).

- Changes every day, due to the incorporation of the UTC date.
- Has only a vanishingly small chance of generating a

point in the same exact location twice via hash collision. Some of them have gotten closeish to each other, however.

- Gathers people who are nearby - everyone within the same $1^\circ \times 1^\circ$ grid square ('graticule') gets the same position, and one hash in the von Neumann 3×3 neighborhood of surrounding graticules is guaranteed to be the closest to a hasher in the central graticule (not necessarily the one for that graticule, however).

The algorithm works as follows:

MD5 is a cryptographic hashing algorithm, and converts plaintext data into a seemingly random 128-bit (32 character) string. A good hashing algorithm should have three main properties: it is non-reversible, you cannot generate any plaintext data back from the hash, and a given sample of data will always produce the same hash value, but even a tiny change to the original plaintext should produce an entirely different hash.

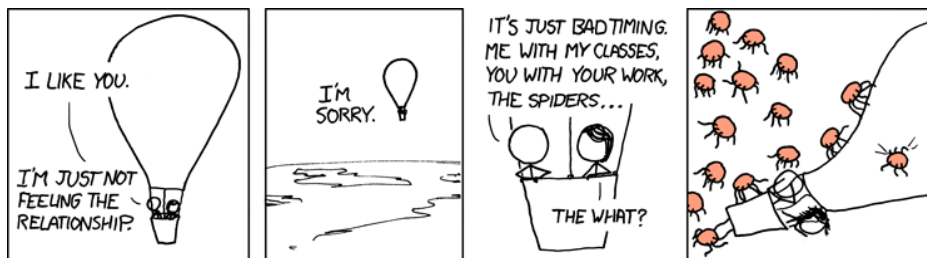
The example co-ordinates are for the Google headquarters in California, as you can see here: 37.421542 -122.085589. The example date, May 26 2005, may reference the fact that the first edition of the Dow came out on May 26, 1896. (Why 2005? Unclear. Perhaps since 2005 is the year xkcd started?)

While geohashing was originally intended as a joke,[citation needed] there are people who geohash regularly. Please see the link to the Geohashing wiki above.

The title-text may imply that people should bring games to their geohashing location on the Saturday following the comic's release. If they do so and take photos, they may post them to the Games We Play page.

#427: Bad Timing

May 23, 2008



Protip: Even without the red spiders, never have that conversation halfway through a balloon ride.

Explanation

Cueball breaks up with Megan in the middle of a hot air balloon ride. Then the red spiders attack.

The red spiders are among the earliest xkcd characters, first appearing in 8: Red spiders.

As the protip in the title text states, a break-up conversation while you are stranded in an inaccessible location is very poor manners. Also, the suggestion may be interpreted that breaking up in a hot air balloon is a very dangerous way to do it; the reaction may result in one or both parties falling out of the basket, or at least make the remainder of the flight very awkward.

This was the first comic to give a protip in the title text, but several have followed, as can be seen in the protip category.

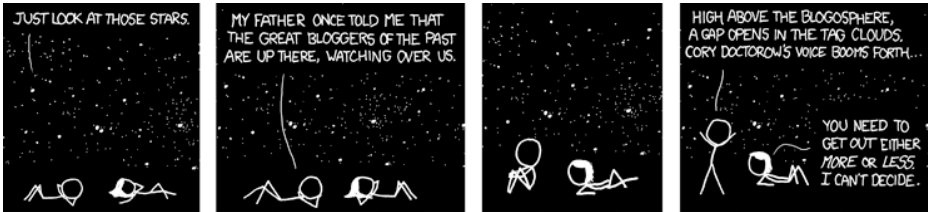
The full series of Red Spiders comics:

- 8: Red Spiders, the first one.
- 43: Red Spiders 2, in which the spiders begin building.
- 47: Counter-Red Spiders, in which the humans begin a counter-offensive.
- 126: Red Spiders Cometh, in which the spiders attack a city.
- 427: Bad Timing, this one.
- 442: xkcd Loves the Discovery Channel, in which it

appears briefly in the 14th panel crawling over a cube.

#428: Starwatching

May 26, 2008



I always figured the word 'blog' would sound *less* silly as the years went by.

Explanation

Megan and Cueball are stargazing. In the first two panels, Cueball references a scene in the movie *The Lion King*, where the protagonist, Simba, remembers how his father, Mufasa, explained the night sky by saying, "The great kings of the past are up there." The quote in last panel is derived from a scene near the climax of the movie, where the spirit of Mufasa appears to Simba in the clouds and speaks to him. Cory Doctorow is a famous blogger who features in several of Randall's comics. A tag cloud is a list of keywords on the sidebar of a blog's layout that helps a reader find posts by hyperlinking to posts associated with that keyword or category. Tags are shown in a proportionally larger typeface if that tag describes more posts than other tags.

Megan interrupts Cueball by saying that she can't decide if Cueball needs to "get out more or less." If she were to say, "get out more," she would be implying that he needs to spend time away from the computer, so he stops seeing links between the real world and Cory Doctorow. If she says, "get out less," she implies that he might scare normal people if he were to do what he does in front of them, or perhaps become more "normal" if he were to stop going outside and not do what he is doing now.

In the title text, Randall mentions that he feels that the word *blog*, a portmanteau and an elision of "web log," sounds silly, and has not become any less silly over the years, despite entering common usage.

#429: Fantasy

May 28, 2008



I guess if she accepted irrational realities, she'd hardly be my fantasy.

Explanation

Cueball is fantasizing about being together with Megan, a girl he really wishes to be with, but he has so far not found any way to make this happen. However, in his fantasy, the imaginary versions of himself and Megan quickly realize how impossible their relationship would be. First of all, neither of them can remember why they are together (a typical trait of dreams, that you are suddenly in some situation but cannot remember what went before). Also, Megan seems to find it very difficult to imagine them being together. Although the reasons are left unstated, it is clear that it is actually Cueball who cannot himself imagine a situation that would make it possible for them to be together, and he projects this into the thoughts of his fantasy version of Megan. He himself mentions the word fantasy, which makes her realize that they are objects in a fantasy (or dream) that will soon end, and then so will they.

Then she decides to destroy the fantasy world they are in instead of going quietly, as she would have once this fantasy ended. She goes for burning it to the ground, and the fantasy Cueball is with her, since he has also realized that he will lose her when this fantasy ends. Rather than allow Cueball's idle daydream to end romantically, they run rampant and bring his fantasy crashing to a halt.

This leaves the real Cueball confused. But in the title text, Cueball realizes that he would only appreciate a girl who refused such an irrational reality, thus the fantasy is

consistent with both of their personalities.

Another "thought bubble comic" can be seen in 248: Hypotheticals.

#430: Every Damn Morning

May 30, 2008



There was something about a cup and a sword and a tree
and a green hill ...

Explanation

Cueball has had a wondrous and striking dream, but is unable to recount it to Megan, as he has forgotten it. The title of the strip suggest that this is a regular occurrence: he wakes up with vivid memories of elaborate and fascinating dreamscapes, but is unable to tell anyone about it, because the memories fade so quickly, he's lost almost everything before he gets the chance.

The title text is a reference to C.S. Lewis's novel *The Voyage of the Dawn Treader*, in which Lucy Pevensie reads a story that “refreshes her spirit” – “That is the loveliest story I’ve ever read or ever shall read in my whole life. Oh, I wish I could have gone on reading it for ten years.” – but afterwards can only remember that it had something to do with “a cup and a sword and a tree and a green hill.”

An effort to remember dreams was made in 269: TCMP.

#431: Delivery

June 02, 2008



Ma'am, I admit that wasn't in the best taste, but you have to admire my delivery! Ha ha, get it? Oh God, don't throw those syringes! Your baby's fine!

Explanation

It is an old superstition that a groundhog (a type of rodent akin to a large squirrel) can predict the seasonal change from winter to spring in early February. A groundhog that sees his shadow and retreats back in his home predicts another six weeks of winter, while a groundhog that does not see its shadow predicts an early spring. This event is celebrated in a small town in western Pennsylvania, where Punxsutawney Phil serves as the forecaster in an annual ceremony on February 2. This, in turn, becomes the basis for the comedy movie *Groundhog Day*, which is also referenced in 1076: *Groundhog Day*.

The joke here is that, instead of a groundhog predicting when spring will come, the baby is predicting the change in season. Evidently, he predicts that we will have six more weeks of winter.

The title text indicates that the doctor was joking about the baby retreating back inside. He then makes a pun that results in an assault by the mother. The word *delivery* can mean the act of giving birth or the presentation of a joke. He then indicates that the baby is fine.

#432: Journal 4

June 04, 2008



Man, this emo shit was supposed to be for people who didn't have hats.

Explanation

In Journal 1, Black Hat explains to Cueball that a hobby of his is to pretend to write in a journal while on the subway, acting embarrassed if anyone sees. He then proceeds to silently scorn the person once they give him any kind of reassurance.

In Journal 2, however, Danish sees through his ruse. She counteracts it by proving that she understands him, and attempts to resign him to the fact that he will never see her again, thus robbing him of the satisfaction of a proper social connection. She leaves, taking his hat in the process. Initially stunned, in Journal 3 he at last regained his hat, the emblem of his personality and attitude, leaving him with the higher ground.

Now, precipitously, Black Hat has found himself to be in love with Danish, even though this counters his whole worldview. He even took off his precious hat. As stated in the title text, he somehow believed that he was immune to such feelings. What is he to do? And why is he in love? And how?

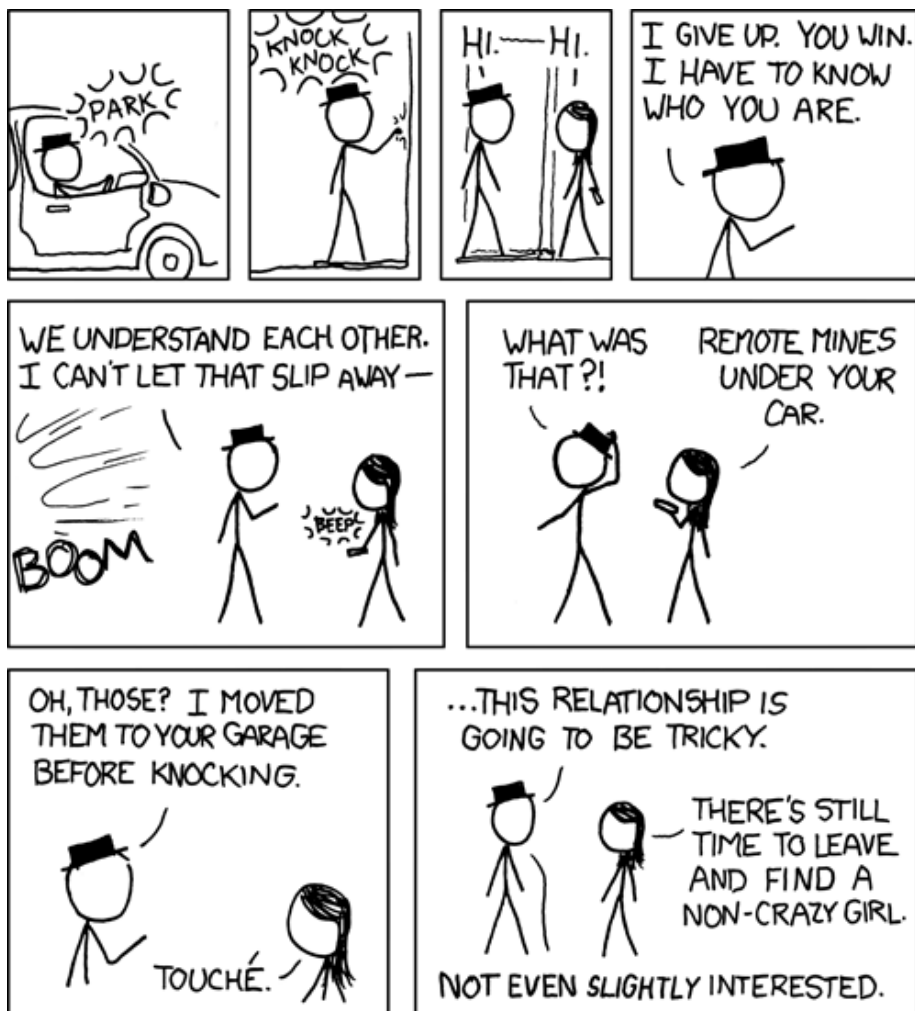
The title text indicates that Black Hat had previously believed that his hat signified, or even caused, immunity from emotional sensitivity (usually depicted in his classhole behavior). The meaning of Black Hat's hat is not specified, but it is clearly something important to him. More evidence of the hat's adumbrative meaning can be seen in 455: Hats.

The whole "Journal" story is:

- 374: Journal
- 377: Journal 2
- 405: Journal 3
- 432: Journal 4
- 433: Journal 5

#433: Journal 5

June 06, 2008



'Pick you up at eight?' 'Nine. I've got to re-mine the driveway.'

Explanation

In Journal, Black Hat explains to Cueball that a hobby of his is to pretend to write in a journal while on the subway, acting embarrassed if anyone sees. He then proceeds to silently scorn the person once they give him any kind of reassurance.

In Journal 2, however, Danish sees through his ruse. She counteracts it by proving that she understands him, and attempts to resign him to the fact that he will never see her again, thus robbing him of the satisfaction of a proper social connection. She leaves, taking his hat in the process.

Initially stunned, he at last regained his hat in Journal 3, the trademark of his personality and attitude, leaving him with the upper hand.

(In 412: Startled he's shown more easily startled than usual, possibly due to Danish setting him on edge and cracking his façade.)

In Journal 4, however, he is overcome with emotions, to the extent that he has even taken his black hat off while sitting head in hand on a bench, wondering in the title text why he would feel any emotions when he has a hat.

Now, in Journal 5, Black Hat parks his car and soon finds himself on the doorstep of Danish's house. He comes to tell her that he gives up and that she wins, because he just has to know who she is. This is very

uncharacteristic of Black Hat. He then tries to tell her that he thinks they understand each other's personalities and that this means something to him. He is obviously smitten with her on some level. But all she does about this initially is use her remote control to set off the mines she installed in the driveway where Black Hat's car is parked.

But, even in his state of love, Black Hat had spotted these mines and moved them to her garage. So when Danish sets them off, she destroys her own garage (and possibly her car) instead of Black Hat's car. When he tells her about moving them, she is impressed and acknowledges this by saying Touché. Maybe this is when she also begins to respect him in her own weird manner.

Black Hat can foresee that it will be a tricky relationship with their sadistic personalities crashing together, but when Danish gives him the option to go find a non-crazy girl, he promptly states that this doesn't interest him at all.

In the title text, it seems that neither of them is deterred by this obstacle, and their relationship begins when Black Hat tells her that he will pick her up at eight, although she does ask for one more hour, so she can booby-trap the driveway again before he comes back at nine. This did not seem to harm their future relationship, as in most of the later comics with Danish she is mainly shown together with Black Hat, sometimes even in a clearly romantic setting, like in 515: No One Must Know, from where she got her name.

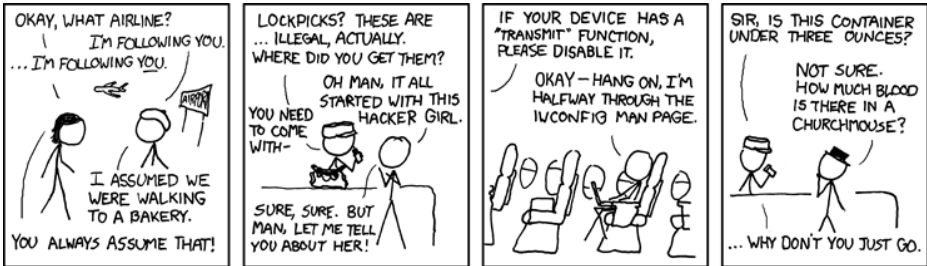
And thus the relationship is born between Black Hat and Danish.

The whole "Journal" story is:

- 374: Journal
- 377: Journal 2
- 405: Journal 3
- 432: Journal 4
- 433: Journal 5

#434: xkcd Goes to the Airport

June 09, 2008



Under three ounces, but it stains panties.

Explanation

The various characters of xkcd cause problems at the airport due to their various quirks.

- Beret Guy and Megan are lost, following each other in a loop. Beret Guy displays his obsession with baked goods as he also does in later comics: 442: xkcd Loves the Discovery Channel and 452: Mission.
- Cueball tries to carry a lockpick set (a tool able to unlock doors without the original key) through security. The security guard tells Cueball that he has to come with him, but Cueball wants to tell the guard about "this hacker girl" before going with the guard (interestingly Cueball doesn't resist the arrest at all so long as he can tell his story). This may be spoofing the incidents where someone has been manipulated into smuggling drugs or other contraband by a romantic interest they met on the Internet. Alternatively, it may reference the fact that lockpicking is a common hobby among hackers, suggesting that Cueball's interest in the girl led to his current interests in hacking, lockpicking or both. The hacker girl could be Elaine Roberts from the 1337-series.
- On the plane, Cueball has been instructed to disable the wireless transmission functionality of his device. Many airlines require passengers to disable mobile phones on aircraft as well as other radio transmitting devices, because they may interfere with the radio-based navigation and communication equipment of the

aircraft. However, his laptop is running Linux, and he doesn't know how to change the wireless settings; he's reading the manual for the program that controls the wireless radio. This is probably not an ideal situation, as the airplane is about to take off. Man pages were also referenced in 293: RTFM. Much later, a plane was again linked to a man page in 912: Manual Override.

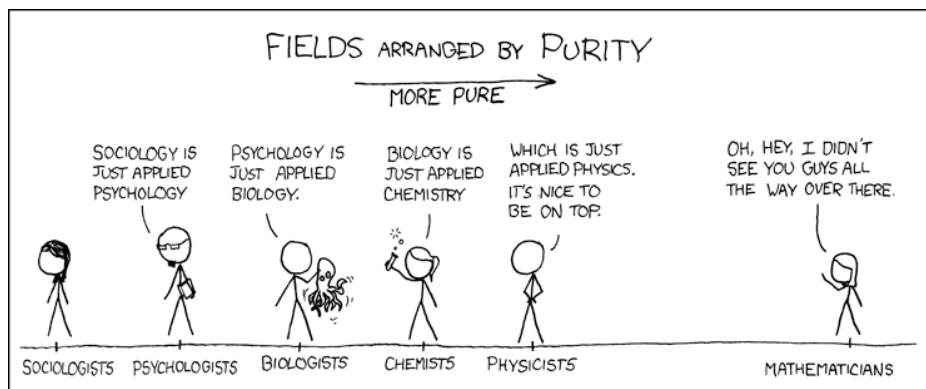
- Black Hat tries to carry a container of liquid through security. According to US law, the maximum amount of liquid that can be taken onto a plane in a container is three ounces (89 ml), a security measure taken to prevent terrorists from taking explosives onto planes. When the guard has doubts about the amount of liquid in the vial, Black Hat implies that the liquid is actually blood from a churchmouse. This is referred to later in 526: Converting to Metric, which claims that a fieldmouse has much less blood than that. The guard is visibly uncomfortable and clearly does not want to deal with the issue any further.

The title text continues off the final panel, saying that there are less than three ounces of blood in a churchmouse, but it "stains panties," an undesirable scenario. However, this undesirable scenario is paralleled by the implied undesirable scenario of a terrorist attack due to explosive liquids, the possibility of which caused the law. The title text seems to parody the prospect of an explosion with the relatively insignificant staining of panties, a term for women's underwear. This may also be a menstruation joke.

From xkcd: volume 0:

#435: Purity

June 11, 2008



On the other hand, physicists like to say physics is to math as sex is to masturbation.

Explanation

Mathematics is the abstract study of topics encompassing quantity, structure, space, change, and others. Physics is a natural science that involves the study of matter-energy and its motion through space and time, along with related concepts such as forces. Physics is described using mathematics. Chemistry is the science of matter, especially its chemical reactions, but also its composition, structure, and properties. As chemical reactions are governed by physical laws (electromagnetism being particularly important), one could say that chemists are studying a subset of physics. Biology is the study of life and living organisms, including their structure, function, growth, origin, evolution, distribution, and taxonomy. As biological life is the result of a large number of complex chemical reactions, one could say that it is studying a subset of chemistry. Psychology is the study of mental functions and behaviors, why thinking beings do what they do. As thought is (currently) a capability exclusive to living things, one could say that it is a subset of biology. Sociology is the study of society, or the study of groups of people and their interactions. Since a group of people is composed of many individuals, one could say that it is an application of psychology. Of course, one could also say that the fields are all independent, as deriving one from another would require not only good, but perfect understanding of the more fundamental field.

Mathematics has two classifications: pure mathematics

(mathematics for its own sake, without any real-world interpretation) and applied mathematics (mathematics intended to solve real-world problems). It is not uncommon for scientists to formulate a problem that can be reduced to a problem already solved by pure mathematicians. Taking this to its logical extreme, the comic arranges the six scientific fields according to the Hierarchy of the sciences, represented by a person on a chart of purity, saying that a field is 'more pure' than the fields depending on it. This is a topic often used in jokes between scientists of various fields as to who is more important. The physicist, Cueball, feels that he is at the top, that all other fields are based upon his... but is ultimately upstaged by the mathematician, Blondie, whose field is so pure that its relationship to more applied fields can be distant or nonexistent. Unlike the others, however, the mathematician notably does not claim that physics is merely applied mathematics, because that claim would be categorically untrue. While physics makes extensive use of applied mathematical methods, physics (and, by extension, all the other sciences) are based on the analysis of experimental data collected about the universe—data which mathematics does not and cannot on its own provide. Later a similar setup was used in 2057: Internal Monologues, although here the different science fields are not ranked against each other, and only the physicist is represented in both comics (although as Cueball in both).

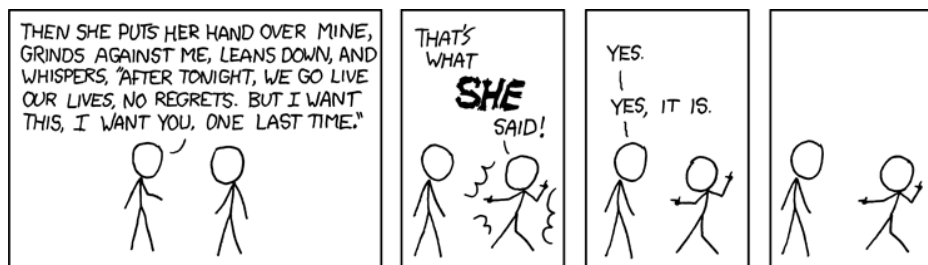
Philosophy is presumably not pictured as it would be so far off to the right end of the image it would require a

scroll bar, not that Randall has shied away from large format strips.[citation needed]

The title text indicates that physicists like to repeat the following quote attributed to Richard Feynman: "Physics is to math what sex is to masturbation.". This ties the title of the comic, "Purity," to tie between various fields, to the topic of sex, as measured by the Purity Test.

#436: How it Happened

June 13, 2008



I was there, dude.

Explanation

The phrase "That's what she said!" is commonly used after someone has described something that sounds sexual but had no intentional sexual meaning. An example might be:

However, in this comic, the first guy is actually describing what his girlfriend whispered to him on the day she leaves him. She is still looking to have sex with him one last time before they go live their lives. It is a very personal moment that he decided to share with his friend. But his friend then responds with a that's what she said.

The first friend derails the other's attempt at a joke by pointing out that that was what she literally said. This is exactly the same as Megan's reaction to a "that's what she said" in 366: Your Mom. In this case, however, the phrase in question already originally had a sexual meaning, negating the joke's humor in finding a sexual meaning of an innocuous phrase in the first place.

The friend is simply frozen in his uncomfortable position, by the awkward moment, while the first guy just stares at him.

In the title text, the first guy continues to make the situation more awkward for his friend by pointing out that he was there, so there is no need to tell him what she said.

"That's what she said!" jokes had been mocked previously in comic 174: That's What SHE Said.

#437: SUV

June 16, 2008



Electric skateboards, by cost, get the equivalent of about 300 miles per gallon. Lithium batteries just need to get cheaper.

Explanation

This is another comic in the My Hobby series. Here, Randall describes a "hobby" of confusing self-righteous hybrid car drivers by creating situational irony. There are many anecdotal instances of drivers of "green" vehicles both criticizing owners of less fuel-efficient vehicles (such as SUVs) and for taunting them about how much more they are paying for fuel. Randall is reversing this by taunting/criticizing the owner of a Prius hybrid vehicle as though their roles were reversed. The owner of the hybrid car is irritated and does not understand what is being said.

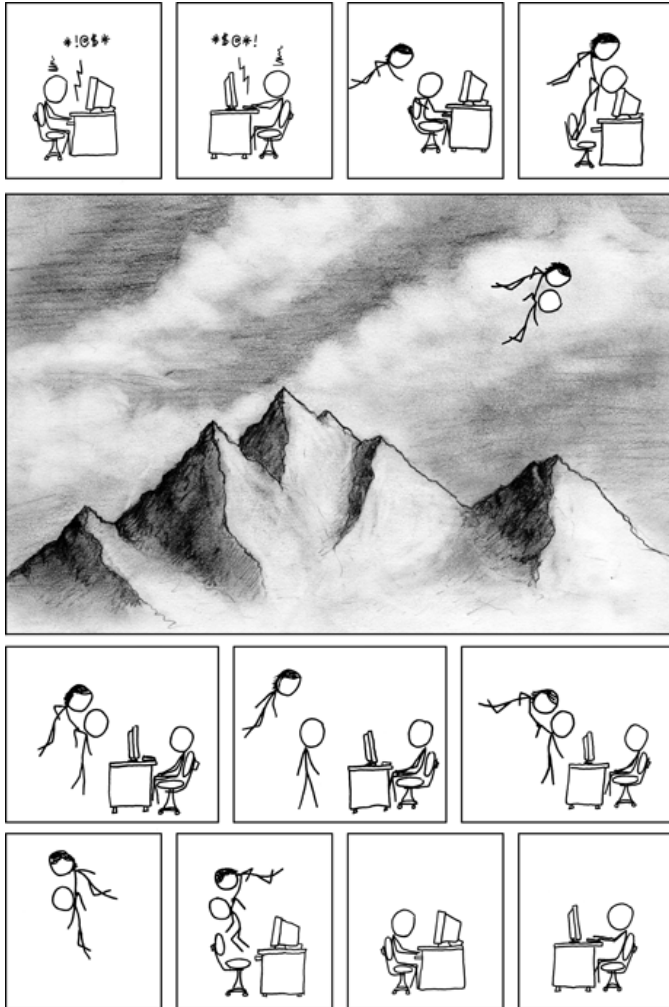
Alternatively, in the second sentence, Randall could be talking about the fact that the other person has a hybrid vehicle instead of a full electric vehicle, although Randall's SUV wouldn't be any better in that case. Another possibility is that "go green" refers to using public transportation or walking (or biking, skateboarding, and so on) in which case there is an argument to be made that the Cueball with the SUV might be better due to taking mass transit more. Or, as the title text alludes to, electric skateboards.

The title text, rather than being a joke or additional punchline, seems to be a serious opinion about how much more efficient electric vehicles are compared to gas-powered vehicles; they would be a far superior form of transportation if only they weren't so expensive. But an electric skateboard can only move a fraction of mass

comparing to an SUV.[citation needed]

#438: Internet Argument

June 18, 2008



It's easier to be an asshole to words than to people.

Explanation

The comic shows two people arguing online, with the argument getting incredibly heated, presumably due to a perceived lack of connection. Then, when Megan brings them into the same room for a moment, the argument settles. This effect is similar to what happens when people drive a car: they're more likely to get exasperated or angry at other drivers than they do when not driving, because the drivers can't see each other's faces or properly identify that they're human in some way.

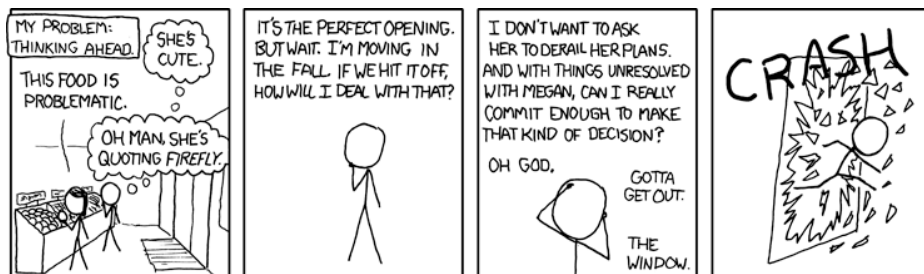
In the first two panels, Cueball is exchanging some possibly profane insults with the other Cueball. Megan takes hold of Cueball and flies him to the other one, so they see each other face to face. In this situation, each remains silent as neither has anything to say to the other.

When Megan returns Cueball to his original computer, they resume their communication, but without the insults.

The title text states the theming of the comic, being that arguments over the internet are easier than in real life, because online, the user is arguing versus "text" rather than an actual human with thoughts and emotions.

#439: Thinking Ahead

June 20, 2008



Did he just go crazy and jump out the window?

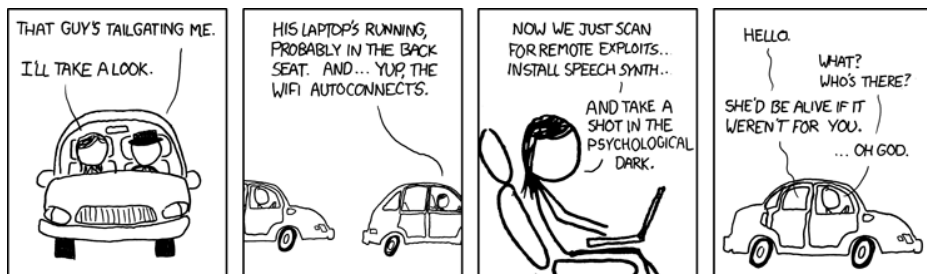
Explanation

Cueball spots a woman while shopping. He thinks she looks cute - probably because she looks a lot like his girlfriend Megan. She is picking out produce, and quotes a line of dialogue from *Firefly* originally said by River Tam (Summer Glau): "My food is problematic." Cueball (Randall) who is a big fan of *Firefly*, notices this, and wants to flirt with her. But then Cueball's internal monologue kicks in and he starts panicking, wondering how he'd deal with starting a relationship with this woman when he's moving in the fall, as well as how things are going to work out with Megan, should things work out with this girl. He panics, needs a way out, and defenestrates himself. In real life, jumping out the window would be a very bad idea. See this for more details.

The title text refers to yet another *Firefly* line from the episode "The Train Job," this one said by Hoban "Wash" Washburne (Alan Tudyk): "Did he just go crazy and fall asleep?"

#440: Road Rage

June 23, 2008



Okay, now just as the loss hits him, slam on the brakes.

Explanation

Road rage refers to aggressive behavior exhibited by (usually angry) motorists towards other people on or near the road. It can take the form of excessive honking, uncharacteristically aggressive driving, and using obscene gestures or language, sometimes escalating into physical violence.

In this comic, Black Hat is driving a car, and Danish is with him in the passenger's seat. Black Hat gets annoyed because the car behind him (driven by Cueball) is "tailgating" (following too close behind Black Hat's car).

Danish decides to fight back, but rather than engaging in typical instances of road rage, she turns on her laptop and finds that the car behind them also has a laptop running. Since the cars are so close, the other laptop is well within WiFi range, so she manages to establish a WiFi connection with the laptop in the other car. Then, Danish finds a security hole (in the comic, a "remote exploit"). She uses it to break into the laptop and install a speech synthesizer. This means that the laptop in the car behind just starts saying words at Danish's will.

The driver of the other car is puzzled when he starts hearing a voice. Since he's alone in the car (and likely wouldn't consider that his laptop might speak to him), he experiences a voice with no identifiable source addressing him out of nowhere, which is highly disconcerting. Danish then escalates this further with a

"shot in the psychological dark", meaning that she causes his laptop to voice an accusation, on the chance that it might have a psychological impact on the tailgater. In order for her plan to work, he would have to have either been involved in someone's death, or have known someone who died in a way that he blames himself for (or could be convinced to blame himself for), and that person would need to be female for the "she" pronoun to work. There are a large number of different ways this phrase could be meaningful to a person, ranging from actual murder to being involved in an accident to simply losing a loved one in a way he feels he could have prevented. Danish obviously keeps the accusation vague to maximize the odds of it having an impact, but she's still taking a chance. Despite the poor chances, the words appears to land, as the tailgater is evidently impacted by the disembodied voice blaming him for this unspecified person's death.

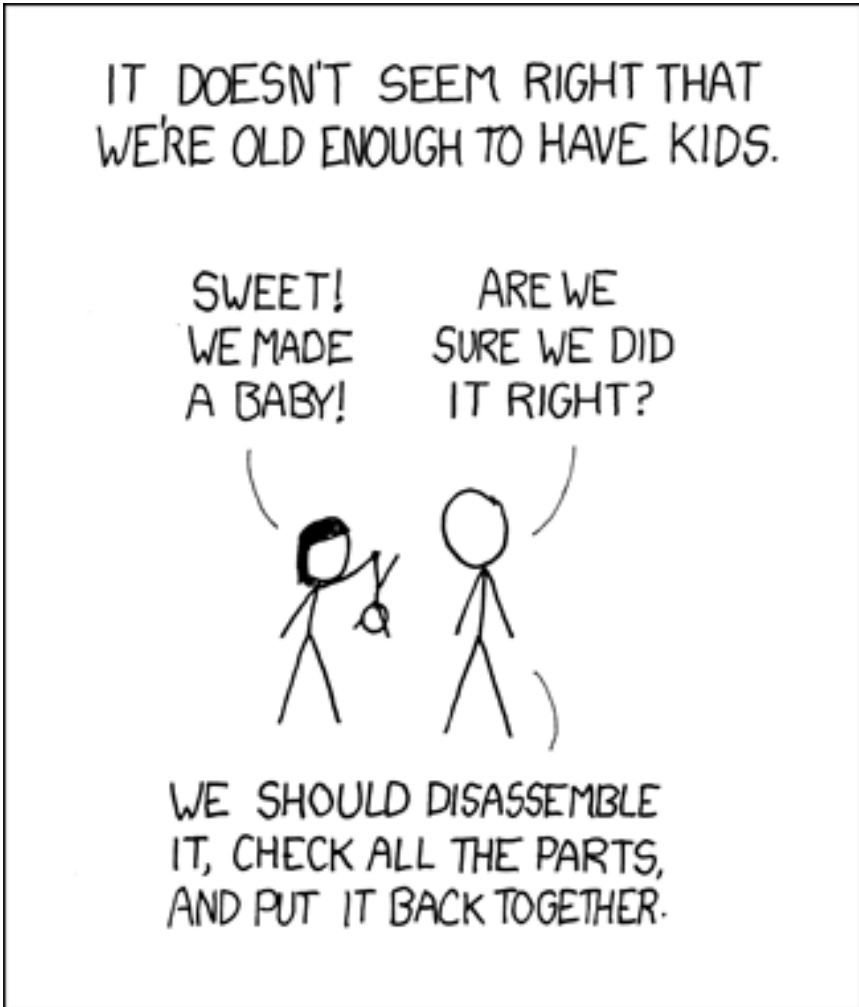
In the title text, Danish continues her revenge, asking Black Hat to slam on the brakes. So-called "brake checking" is a common (and highly unsafe) form of road rage against tailgaters. At minimum, it forces them to abruptly decelerate and hopefully frightens them, but the danger is that they don't have room to stop in time and cause a collision. The joke is that, having already achieved a complicated and psychologically painful form of revenge, Danish wants to follow it up with a much more conventional form at the worst possible time. Since it is commonly believed that the blame for such types of accidents will always be given to the driver of the car

behind, and since we know Black Hat is a sadistic bastard, Black Hat would no doubt enjoy adding both the blame and the traffic accident on top of what Danish has already accomplished. This may seem ironic, as Black Hat and Danish would be risking having their own car struck, but they would no doubt rather make an example than avoid the accident.

In truth however, while many jurisdictions do have a presumption that the rear driver is at fault in the event of a rear-end collision, that is only an initial presumption that can be rebutted by the facts of the case. Deliberately slamming your brakes for no good reason except to cause a traffic accident is illegal in virtually every jurisdiction, and that would be more than sufficient to defeat the presumption. In addition to being potentially liable for any damages, Danish and Black Hat could potentially be injured (possibly seriously) in such a collision. Being willing to risk their own safety in order to screw with someone they don't like is very on-brand for them.

#441: Babies

June 25, 2008



I bet my future kids will read this someday. **DEAR FUTURE KIDS:** how did you get internet in the cellar?

Explanation

A common theme of xkcd is that one never feels that one has "transitioned to adulthood," in the sense of actually attaining the seriousness and sense of responsibility that children imagine all adults to possess. Here, the author illustrates this by imagining Cueball and Megan taking on the ultimate "adult responsibility" — having a child, treating it as they would any other engineering project. Disassembling a project to check the parts is an activity that is appropriate for a self-built computer or robot, but most people would think that disassembling a child would be impractical. Also, unless they've taken Dr. Frankenstein's course on reassembling and reanimating human beings, this would result in a grisly end for the baby.[citation needed] Megan also shows her lack of child experience by holding the baby upside-down by the foot, which isn't a good idea. Her behavior could also indicate that Megan is treating the child as an object rather than a human being.

The title text implies that Randall will have kids someday. It will be surprising if they read this comic, not just because it will give them an unflattering look into their father's attitudes on having children, but because he plans to lock them in the cellar where there will be no internet access. This is possibly a reference to Kaspar Hauser, who, as a boy, claimed to have grown up in a dark cell in Germany in the 19th century, or to the incestuous children of Josef Fritzl.

This is also the topic of 674: Natural Parenting and 1384: Krypton.

Much later, a comic with the singular version of this title was released: 1650: Baby. Here, Cueball refrains from saying something as stupid as he does here about another couple's baby. The couple looks similar to the one in this comic, though that may just be due to the basic-looking art style of xkcd.

#442: xkcd Loves the Discovery Channel

June 27, 2008



I love the title-text!

Explanation

This comic is a parody of the Discovery Channel commercial showing various clips of people singing a song with the chorus line 'Boom De Yada'. The comic is divided into a grid of 4 panels by 6 panels, most depicting a character or situation from a previous xkcd strip. In each panel is written a part of a song similar to the song from the Discovery Channel commercial.

The campaign from the Discovery Channel was not called "Boom De Yada," but "I Love the World". The title "xkcd Loves the Discovery Channel" is in reference to this.

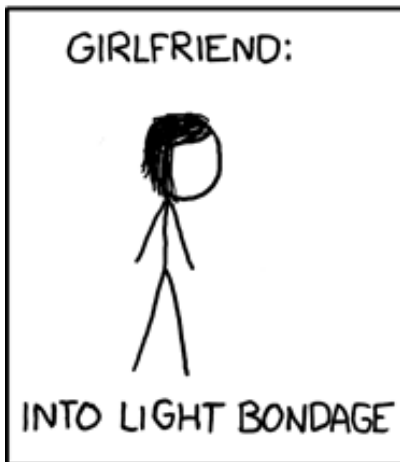
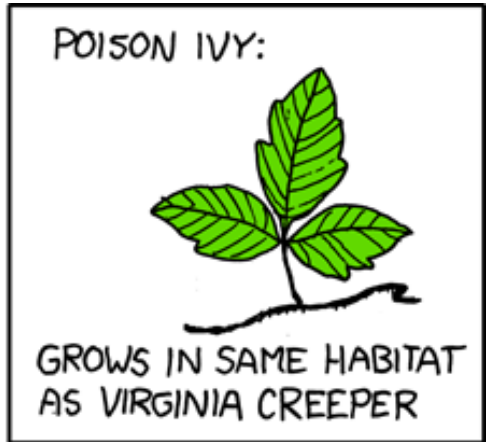
Most of the panels are references to previous xkcd strips, but a few are not.

The title text continues the song, self-referentially. Self-reference is a reoccurring theme in Douglas Hofstadter's books, notably Gödel, Escher, Bach, which Randall refers to directly in 24: Godel, Escher, Kurt Halsey. Later, Hofstadter has been referenced in other comics, such as in the title text of 555: Two Mirrors and 608: Form, plus, of course, in 917: Hofstadter. Self-reference as a form of humor was also explored before, but most famously in the later 688: Self-Description.

From xkcd: volume 0:

#443: Know Your Vines

June 30, 2008



RELATIONSHIP AFTER CAMPING TRIP: STRAINED.

Friggin' modern tents don't have a single piece of rope.

Explanation

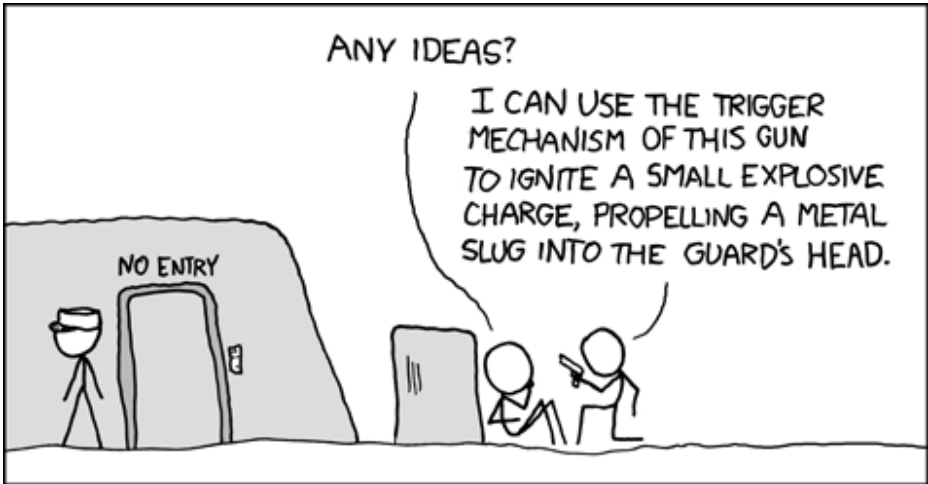
Randall points out that the Virginia creeper is a plant with 5 green leaves that can be used as a rope. He then points out that poison ivy is another vine-like plant with 3 green leaves that also grows near camping areas - but causes skin rashes. His girlfriend is into light bondage (being tied up or tying up another for erotic purposes), yet the area around their tent was too dark to differentiate between the two vines when they went looking for some impromptu rope.

The implication: Either Randall, his girlfriend, or both spent some time that night wrapped in poison ivy. The resulting painful rashes were likely blamed on the one who harvested the wrong plant, and the relationship suffered.

The title text refers to the fact that many modern tents are self-supporting and no longer require rope to put up. Had there been tent rope on hand, there would be no need to look for vines.

#444: Macgyver Gets Lazy

July 02, 2008



At the time of this writing, Wikipedia has a wonderful article titled 'List of problems solved by Macgyver'.

Explanation

MacGyver was an '80s and early '90s TV character, famed for improvising complex devices in a matter of minutes in order to escape dangerous situations. In this comic, MacGyver suggests an unusually direct plan—shooting the guard in the head. However, he still manages to describe his plan in a way that makes it sound like a typical MacGyver-style miraculous improvisation.

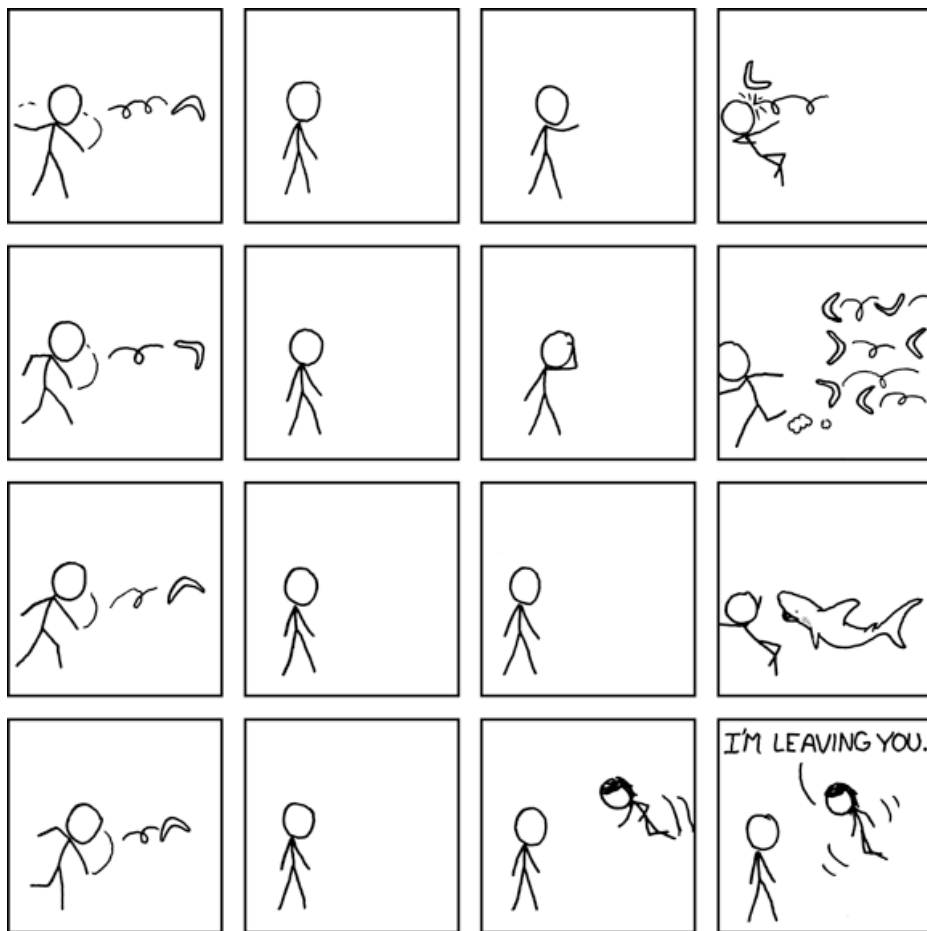
It is worth noting that in the show, MacGyver was adamantly against the use of guns and never used one (at least, not for its intended purpose) in the entire run of the old series. In addition, his devices, traps and plans were generally designed to be non-lethal, typically causing no more than minor injuries. The notion of him simply killing a guard would be a major departure for the show.

A MacGyver reboot was made in 2016 and was not well received (38% on Metacritic, 4.6/10 in IMDb). Despite this negative reception, the series began its fifth season in December 2020.

The Wikipedia page referenced by the title text redirects to the main MacGyver entry since September 2012. The Wikipedia page can still be found in history, and the content has been moved to MacGyver wikia and expanded. As of now, the page redirects to MacGyver (1985 TV series).

#445: I Am Not Good with Boomerangs

July 04, 2008



Bonus strip: just read the rightmost panels straight down.

Explanation

The strip shows Cueball throwing a boomerang four times, each time finding difficulty in catching it.

The first time, it merely hits him in the head.

The second time, six boomerangs come after him.

The third time, a shark somehow returns to him.

The fourth and final time, his girlfriend Megan floats back to him—then she states: "I'm leaving you."

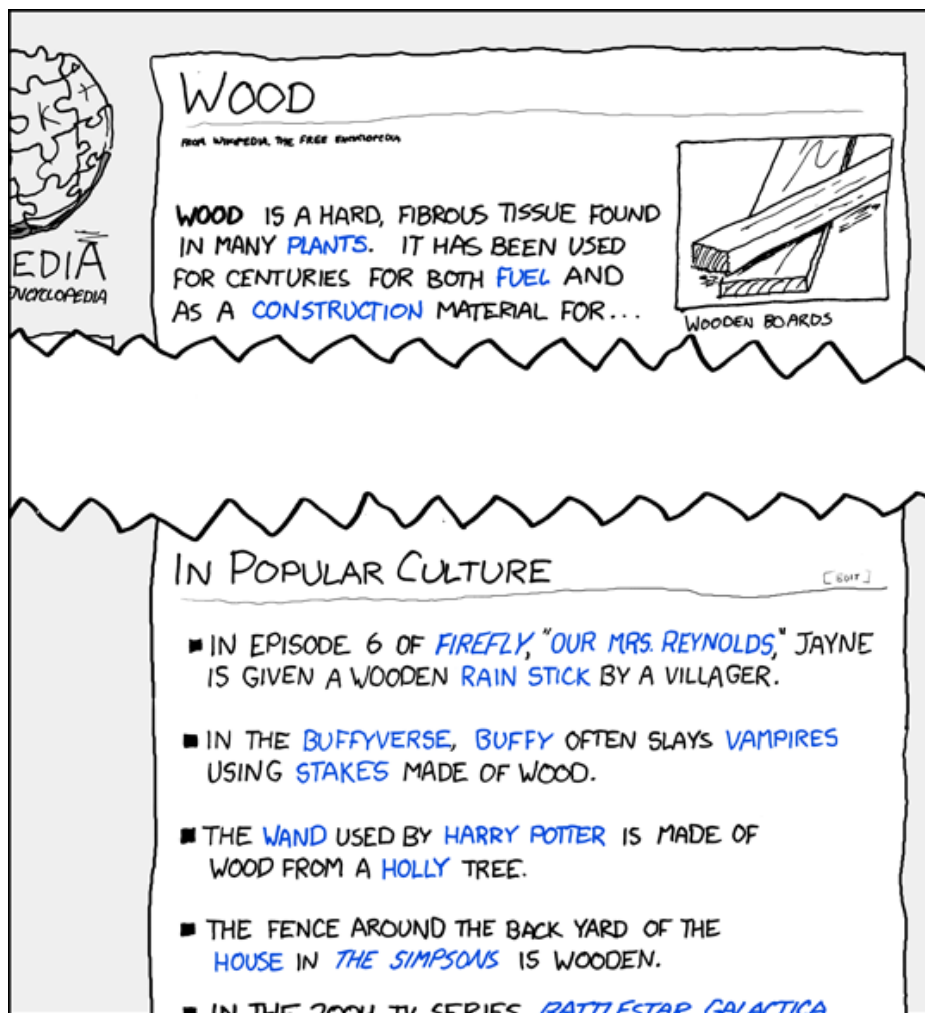
The title text refers to a bonus strip—if one reads the rightmost panels straight down, one gets a strip that suggests that Megan threw multiple things at him out of anger before breaking up with him. This seems to mirror the plot of the 2006 comedy film *My Super Ex-Girlfriend*, in which the eponymous character throws multiple things at the protagonist (including a shark) before breaking up with him.

Boomerangs return in a kind of sequel 475: *Further Boomerang Difficulties*, which might also have yet another sequel in 939: *Arrow*. Finally, boomerangs also became a main theme in the interactive comic 1350: *Lorenz*. The same format of multiple bad endings to the same starting set-up is used in 1515: *Basketball Earth*.

From xkcd: volume 0:

#446: In Popular Culture

July 07, 2008



Someday the 'in popular culture' section will have its own article with an 'in popular culture' section. It will reference this title-text referencing it, and the blogosphere will implode.

Explanation

Wikipedia is a popular online encyclopedia with articles that are created and edited by the general public.[citation needed] Wikipedia entries have many sections, with the first few explaining the general concept and details behind the subject.

When this comic was written, many Wikipedia articles had a section at the end entitled "in popular culture," listing TV shows, movies, songs, and so on that made reference to the subject at hand. In many cases, this list was extensive, possibly because the people editing the articles were such fans of the subject or the pop culture in which it is referenced. They couldn't help but go into great detail, listing many esoteric and seemingly irrelevant elements of pop culture that were peripherally related to the subject of the article. As an example, see the old article *Apollo in popular culture*, which as of August 2007 redirects to *Apollo*. This comic caused a lot of vandalism adding an "In popular culture" section to the wood page.

The joke in this case is that even such a mundane article such as one on wood could have an "in popular culture" section, and, obviously, wooden items are common enough that there are any number of instances of popular culture that could be considered to "reference it," even if that's something as basic as a wooden item being used as a prop in a TV show. Such information would be of little or no use to anybody, and only

somebody obsessed with wood, a particular element of pop culture in which wood makes an appearance, or the concept of placing pop culture references in encyclopedia articles would bother to create or maintain such a section. In fact, at the date of this comic, the article "wood" didn't have a "popular culture" or trivia section.

Also, wood being such a popular material, the list of references could be virtually endless. This is a reference to the fact that the "in popular culture" sections of many Wikipedia articles contained dozens of items, even for articles on fairly arcane subjects. Note that the end of this particular "in popular culture" section is not visible, so we don't know how long it is.

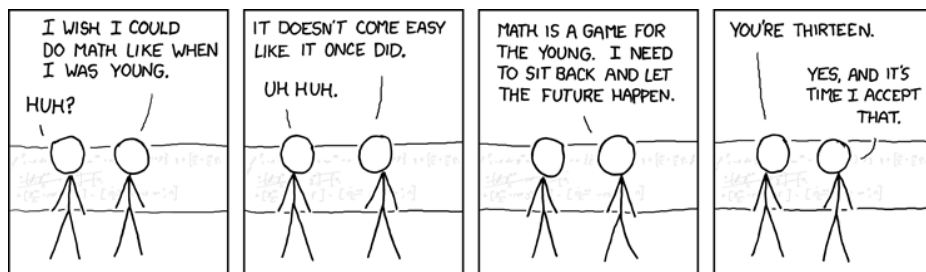
The title text states that in the future, there will even have to be a wiki page with the subject "In popular culture." This article will also need an "in popular culture" section, and it will be obvious to make a reference directly to this title text, as xkcd is part of popular culture and because this title text predicted the creation of and a need for such a page. However, this would then create a circular reference. This could be considered a form of infinite loop, which is one way to cause a computer to crash (lock up). The joke is that the blogosphere could follow this endless train of circular links and itself crash, causing an "implosion."

This comic was actually mentioned in Wikipedia: "In popular culture" content (however, the blogosphere did not implode).[citation needed] However, on April 23,

2014, the reference was edited out, although it was added back in May 2015. It has also been added under the external links section of Wikipedia:xkcd in popular culture.

#447: Too Old For This Shit

July 09, 2008



They say if a mathematician doesn't do their great work by age eleven, they never will.

Explanation

This comic makes fun of the fact that most mathematical geniuses have done their exceptional work (for which they eventually become famous) in their early years by exaggerating it, particularly given that "too old for this shit" is a phrase more appropriately used by people later in age. At the age of thirteen, most precocious mathematicians would not be pushing the frontier of mathematical knowledge, let alone to the point where they would be "too old for it." As such, this is more of a joke about a young boy attempting to dismiss the world around him. It also plays on the fact that in xkcd comics, it is often difficult to tell age because of a lack of detail, which is necessary to set up the final punchline.

A striking example is Carl Friedrich Gauss, the famous mathematician, who wrote his exceptional masterpiece *Disquisitiones Arithmeticae* at the early age of 21. This idea was for instance used in the fictional biography of Gauss, *Measuring the World*, where he admits to having trouble understanding his own work when he got older because of his age.

The "age theory" applies to physics as well. Albert Einstein was also very young (26) when he published his four groundbreaking papers in the same year (his *Annus Mirabilis* in 1905) including the one that eventually gave him the Nobel Prize. Later in life, for instance, he never accepted the theory of quantum physics - which is now a very well-established theory.

The title of the comic, "Too Old For This Shit," is also a reference to the Lethal Weapon series, in which one of the main characters (Roger Murtaugh, played by Danny Glover) is repeatedly quoted as saying things along the line of "I'm too old for this shit."

The title text asserts that thirteen is way too old as it claims that mathematicians should do their great work at the age of eleven! If not - they will never do anything great.

#448: Good Morning

July 11, 2008



As my standard, I use going to sleep at midnight and waking up at 8 AM.

Explanation

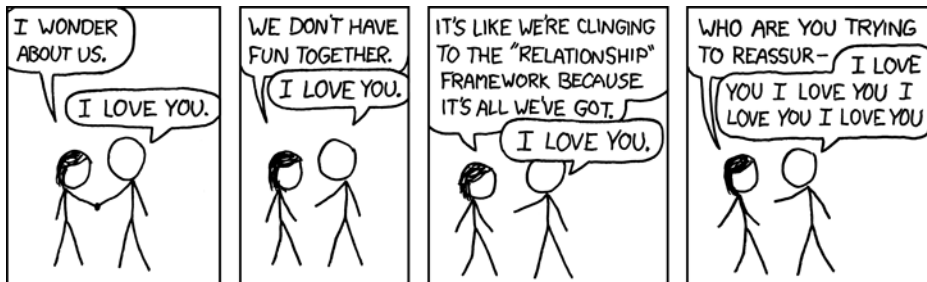
Both characters have irregular sleeping schedules (possibly because they are programmers). As such, their circadian rhythms have become out of sync with one another, and probably out of sync with everyone else in their own timezone. They therefore experience something similar to the "jet lag" experience by travelers going from one timezone to another.

The title text clarifies that they are using "going to sleep at midnight and waking up at 8 AM" as their standard of measurement. If the drowsy man was "in Honolulu" yesterday and has woken up "in Taipei," it means he has gone to sleep 6 hours later than yesterday, and is now also waking up 6 hours later than yesterday (if you don't take the International Date Line into consideration).

This comic may (like in 320: 28-Hour Day) be a commentary of the 28 hour day where a person shift their sleep patterns to 6 x 28 hours a week instead of the usual 7 x 24 hours.

#449: Things Fall Apart

July 14, 2008



'I'm nothing without you' is a fucked-up sentiment.

Explanation

Megan and Cueball are about to break up. Megan is trying to explain things, but Cueball is constantly saying "I love you," asserting that the fact that he loves her should be enough to keep her from breaking up with him. But while loving the other person is a necessary condition for sustainability, it is not a sufficient reason all on its own.

The title text says that 'I'm nothing without you' is a fucked-up sentiment. This could read to imply that that's what Cueball really means, and he isn't saying it that way because 'I love you' is a more acceptable way of expressing it. Saying it over and over again, like he is doing, has almost the same effect, though. Conventionally, it could be said that the mindset of someone believing that they are nothing without their partner—in other words, defining their identity in terms of the other person—is a dangerous and unhealthy sentiment. A person should have enough self-identity and sense of self-worth to know that they have value even outside the context of a relationship.

The title of the comic, "Things Fall Apart," could be a reference to the poem *The Second Coming* by W.B. Yeats, which contains the line "Things fall apart; the centre cannot hold," implying that things between Megan and Cueball are falling apart, and the fact that Cueball is still in love with Megan (arguably, the "center" of the relationship) isn't enough to sustain them. It could

also be a reference to the novel *Things Fall Apart* by Nigerian author Chinua Achebe.

#450: The Sea

July 16, 2008



And then a second one, to drain the sea.

Explanation

Cueball becomes introspective when contemplating the sea. The straightforward reading of "how small I really am" means he feels humbled by the sea and recognizes his insignificance on this planet. This is a common sentiment expressed in poetry, literature, and blogs.

The final line I should get one of those pumps is most likely to, at first, be understood as getting a pump to drain the ocean. The reflection on the joke would run along the line that Cueball is so unsatisfied with the way the ocean makes him feel, the size of the sea intimidating him, that he intends to drain the sea to make him feel better about himself. (This is of course impossible as the size of the sea is many billions if not trillions of times bigger than the biggest storage tanks on Earth today.)

However, in English, the sentences I'm small and I'm big can also be a euphemism for my penis is small and my penis is big.

Even if Cueball is not literally saying that he has a small penis, men very commonly associate their own self-image with the size of their organ. Therefore, enlarging it would improve their self-image and make them feel less small.

The final line in the comic: I should get one of those pumps, could thus be understood to reference a penis pump, a device that is alleged to permanently increase the size of the male member.

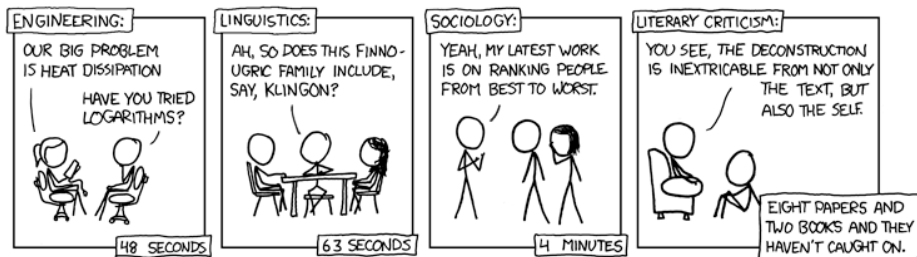
The title text is referencing that Cueball would also like another pump - and this one should be the one for draining the sea. But by specifying in the title text that the first pump is not for the sea, Randall is ensuring that it is possible to understand the full joke.

#451: Impostor

July 18, 2008

MY HOBBY:

SITTING DOWN WITH GRAD STUDENTS AND TIMING
HOW LONG IT TAKES THEM TO FIGURE OUT THAT
I'M NOT ACTUALLY AN EXPERT IN THEIR FIELD.



If you think this is too hard on literary criticism, read the Wikipedia article on deconstruction.

Explanation

While the comic is ostensibly about grad students, it is really Randall's way of poking fun at the relative rigor of different fields, reminiscent of 435: Purity. In the comic, Cueball attempts to pose as an expert in a given field (a recurring pastime of his) and sees how long it takes before the real experts detect his nonsense.

The first panel shows Cueball discussing an engineering problem with Ponytail. Ponytail is talking about an immediate practical problem involving heat dissipation. Cueball suggests 'using logarithms' to solve it. Logarithms are a mathematical tool used for expressing an exponential relationship as a linear one. While they may be used to model the effects of heat dissipation over time, Ponytail is looking for a way to change the rate of heat dissipation, like "water cooling." It only takes 48 seconds before he exposes himself.

The second panel shows a conversation with linguistic grad students who are apparently discussing the Finno-Ugric language family (a family of related languages that includes Hungarian, Finnish, and Estonian). Cueball asks if Klingon is included in this family. The linguists instantly recognize the meaninglessness of the statement — either because Klingon is a constructed language, designed to sound "alien" to avoid sounding like any human language (thus it cannot be part of any real linguistic family), or because "Klingon" is a recognizable pop-culture reference. Either

way he has exposed himself after only 63 seconds of conversation.

In the third panel, the humor comes from the fact that the idea of sociology existing to rank human beings on some arbitrary intrinsic value is not only ridiculous in a scientific context, but also politically offensive. Cueball unknowingly recreates the logic behind some of the worst crimes in human history, a problem sociologists are trained to be very aware of. However, it may be something that a less educated non-sociologist would assume could pass within the field. When he describes his unscientific and offensive approach, we see one of the sociology grad students facepalming in exasperation. Because a non-expert may be able to sound somewhat educated in sociology before making such a slip-up, it is four minutes into the conversation before he is detected.

In the final panel, he attempts to pass as an expert in literary criticism. This field notoriously uses a great deal of impenetrable jargon, so when Cueball makes up seemingly meaningless sentences, no one notices. His quip at "deconstructing the self" may be a meta joke about the field itself failing under deconstruction... (or this sentence may be a meta-meta- example of someone applying literary criticism standards to the analysis of this specific comic). We find that rather than being caught out within minutes as in the other fields, he has now published 8 papers and 2 books. The humor comes from the fact that he has accidentally made himself into a recognized authority in the field, despite not having any idea what he was talking about. In this panel, Cueball is

sitting in an armchair in the position of an expert lecturing to a student, who sits at his feet apparently absorbing his inane statement.

This implies that the field itself has published a great deal of meaningless things that only superficially look meaningful through the impenetrability of the jargon. The title text challenges the audience to take a look at the Wikipedia article for literary deconstruction if they don't believe this criticism applies - the Wikipedia article in question is almost constantly flagged for "clean-up" on the grounds that it's a jumbled mess. An archive of the article as it was when this comic was published is available [here](#).

#452: Mission

July 21, 2008



Don't you know? The chances of a random object being a scone are about one in six.

Explanation

Cueball and Beret Guy are on a mission, intending to destroy whatever machine they are in, except that Beret Guy tends to be a bit surreal and brought a bag for holding pastries instead of explosive charges.

This is not the first time he's made such a bakery mistake; see 434: xkcd Goes to the Airport.

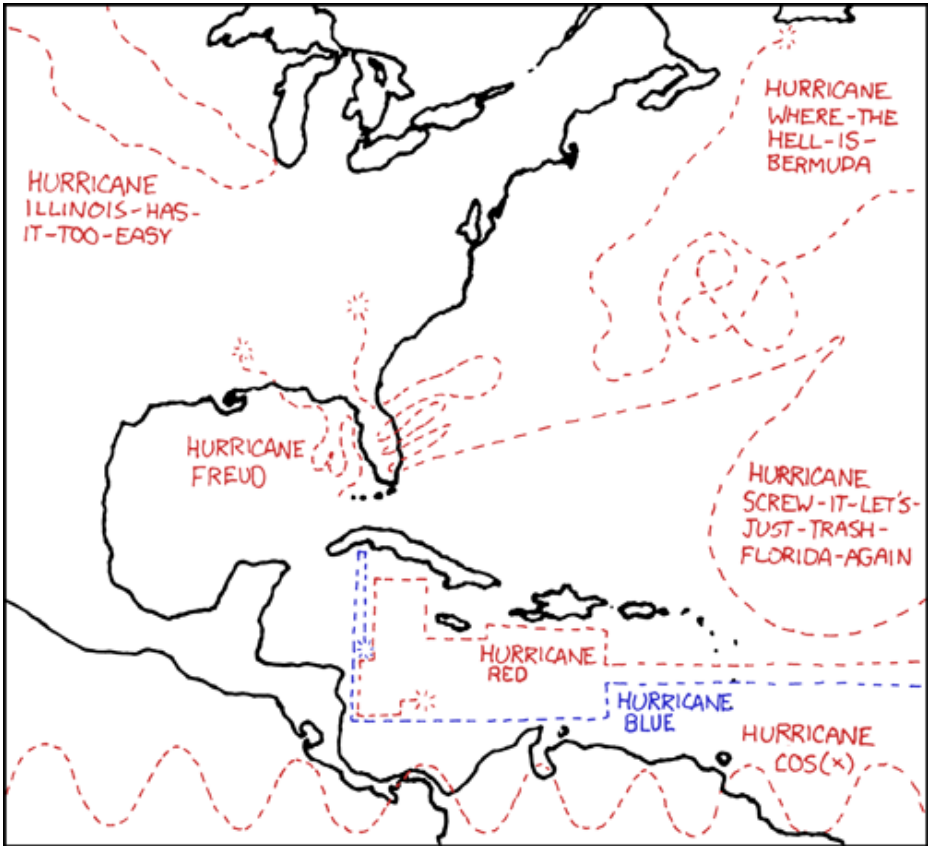
He then attempts to eat what Cueball identifies as lug nuts, believing them to be scones. In reality, lug nuts do not look very similar to scones.[citation needed] He bites into them and it hurts him, but as he says, maybe some of them are not lug nuts, and he wishes to test them all. (One of Beret Guy's strange powers seems to be superhuman jaw strength: the crunching sound implies he is biting down on steel lug nuts hard enough to crack them apart)

The title text further emphasizes Beret Guy's obsession with bakery goods, by stating that if a random object is selected, there will be a $1/6$ chance that it is a scone, which explains his behavior with the lug nuts. This is, of course, a ridiculous assertion, as if it were true, more than 16% of all things in the universe would have to be scones. (However, Beret Guy's obsession with bakeries and the fact that he doesn't realise he's not in a bakery could make this statement justified from his perspective.) Given Beret Guy's powers, he may have just made this true.

Beret Guy and scones are also referenced in the title text of both 677: Asshole and 1030: Keyed.

#453: Upcoming Hurricanes

July 23, 2008



I'd like to see more damage assessments for hurricanes hitting New York and flooding Manhattan -- something like the 1938 Long Island Express, but aimed a bit more to the west. It's just a matter of time.

Explanation

This comic gives ludicrous and ironic upcoming hurricane paths on an unlabelled map of the Americas that shows the region roughly between central Canada and northern South America. Blue and red dotted lines indicate the future hurricane paths.

Hurricanes[edit]

Enters from the east side of the map, wanders around the Atlantic Ocean in a scribble that seems to take the shape of an Ampersand. Then it goes north for a while, and then peters out without entering the Bermuda Triangle. The Bermuda Triangle is a location in the Atlantic Ocean loosely framed by the three corners Bermuda, Miami, and Puerto Rico. The myth is that (too) many ships and planes get lost once they enter inside the area of this triangle and disappear without a trace. In this case, the hurricane gets lost before entering and can't even find the triangle. It may also simply be a reference to the statistic that Bermuda is affected by many Atlantic hurricanes, and that this hurricane got lost on its way to its target.

Comes from somewhere to the north-west, goes through Illinois, and then back to the north-west. Illinois is located far from the ocean, and thus suffers few hurricanes[citation needed] - this particular one is extremely unlikely, and according to the name, exists purely so that Illinois will have a hurricane to deal with. Interestingly enough (though it did not affect the Chicago area or correspond with the path displayed in the comic), roughly one year later, a Super derecho, a storm resembling a hurricane or tropical storm in movement and form, struck central and South

Illinois, in addition to much of Missouri and Kansas.

Refers to Sigmund Freud, who believed that accidental sexual expression was a reflection of the unconscious mind's sexual desires. The hurricane's path forms a pair of testicles beside Florida. Florida, due to its shape and location, resembles a penis,[citation needed] and the hurricane's shape and position exemplify Freud's ideas.

Comes from the east, starts to curve to the north, and then turns sharply to head straight for Florida and zigzag through it four times before dying out. Sticking out from the rest of the US, Florida is prone to hurricanes from the East, South, and West. And with the state not being very high or wide, it is common for a hurricane to run over Florida, lose some strength, then rebuild strength over the hot waters in the Gulf of Mexico, only to do a U-turn and strike again. This is not exactly what happens with this particular hurricane, where it turns out into the Atlantic Ocean again each time, suggesting a malicious intent.

Blue is the only hurricane path drawn in blue. The two hurricanes are playing a game zipping in straight lines and right angles around Haiti, Jamaica, and Cuba. When Red successfully cuts off Blue, the latter instantly dies, and then Red dies shortly thereafter. The game they play is the game of Light Cycles from the video game based on the movie Tron. Hurricane Blue lost because it crashed into the wall of light left by Hurricane Red's light cycle. (Note that real hurricanes are not dotted lines[citation needed]; the two hurricanes would have merged long before Hurricane Blue "lost.")

Forms a curve in the shape of a sinusoid above the bottom edge of the map. Its path resembles a sine wave. This kind of

trigonometric functions can, however, both be expressed as $\sin(x)$ or $\cos(x)$, the latter being a cosine wave. They look exactly the same when there is no clearly defined coordinate system as in this case. Given this oscillates between six and ten degrees north (using Paramaribo and the southern shore of

Trinidad as references) perhaps this hurricane might be better described as Hurricane $2 \cos(x) + 8$.

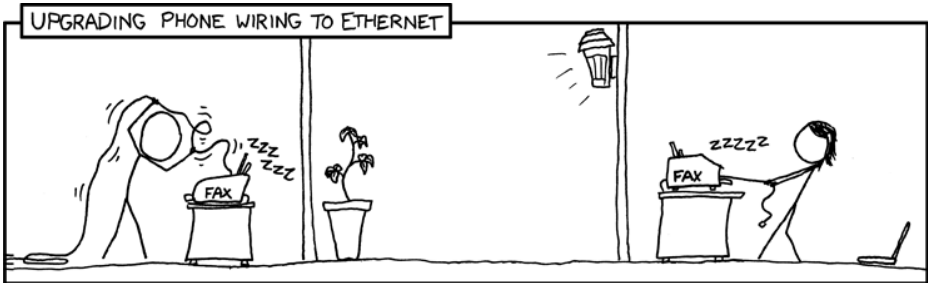
Title Text[edit]

The title text refers to the 1938 New England hurricane (also known as the Long Island Express) that caused \$4.7 billion in damage. Had it been further west, it could have caused more damage, as the right side of a hurricane is stronger and more destructive than the left side, as the winds on the right side push water inland. Randall asks for more damage assessments for such a hurricane that would be able to flood Manhattan in New York. Only four years after this cartoon was published, making it almost prophetic, Hurricane Sandy did strike the New York–New Jersey area as a post-tropical cyclone storm. Hurricane Sandy caused an estimated \$74 billion in damage.

The 1938 hurricane is also referenced in 980: Money, where it is calculated that it would have caused \$78 billion had it happened in 2011. However, if that hurricane had taken the same turn as Sandy did, the cost today could have been a staggering \$237 billion.

#454: Rewiring

July 25, 2008



My friend Finn tried to mail one end of the cable to me and thread the mail system.

Explanation

At the time this comic was written, most residential buildings in North America were wired for analog devices using the old landline telephone services, although thanks to the growth of internet telephone and wireless telephone technologies, including cordless and mobile phones, this in-house wiring was increasingly redundant. See also Use of mobile phones. At the time, people who took their internet access seriously would have preferred that at least some of the phone wiring and phone jacks in their residences were Ethernet (Cat-5 or Cat-6) wiring and (RJ45) jacks for providing wired internet access throughout their home, or in this case, to their neighbor's home, so that they wouldn't have to resort to Wi-Fi, which was then slower and less reliable than a wired connection.

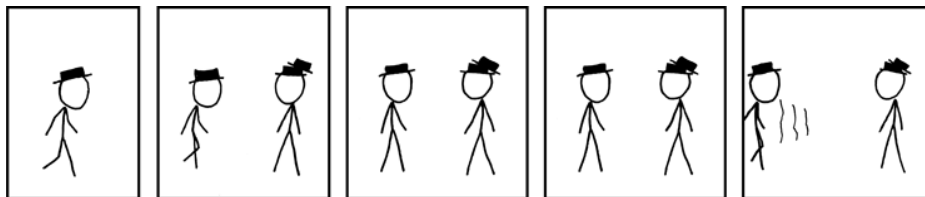
Since the faxing of the ethernet cable is apparently successful, the comic is not really about the conversion, but is instead a subtle computer network joke about tunneling, whereby you can embed one kind of network access protocol within a very different protocol. Herein lies the humor: Cueball and Megan are apparently under the impression that they can achieve a faster connection by tunneling a high-speed protocol (ethernet) through a slower (landline telephone service) one. Generally speaking, this is not true. The only exception is when embedding a compressed data stream within a non-compressed standard. The performance boosts, however, are typically modest for lossless compression,

and not the orders of magnitude difference our novices apparently hope for.

The title text suggests that it shows a fanciful way of converting analog phone lines to digital ethernet lines by simply faxing an ethernet cable, since a fax machine is a tool for converting analog content into digital. The title text is a reference to foonetic user relsqui and this comic was presumably inspired by this conversation they had over IRC.

#455: Hats

July 28, 2008



...

Explanation

Black Hat encounters a person who is wearing not one, but two black hats. Black Hat is not a person to be trifled with, but from his reaction, he apparently believes that Two Black Hats represents a considerable danger to him. Black Hat knows how dangerous he is to those with one fewer black hat than him, so he continues the logic and realizes that one who has one more black hat must be proportionally dangerous to him.

If a black hat is assumed to be akin to a badge of rank, then Two Black Hats certainly is superior to him in the capacity and willingness to do evil. Alternatively, and even more worrying, Two Black Hats could be someone who has the desire and the ability to acquire black hats (possibly killing the previous owners in the process if having two black hats really means that the individual is more malevolent than Black Hat), which he then wears like a badge of honor. With all this in mind, Black Hat edges away, keeping Two Black Hats in sight at all times. This movement and the accompanying line could also be interpreted as Black Hat being physically pushed away, like two negative or two positive poles of a magnet, although this does not explain why it only starts after a beat panel.

Another interpretation is that the left figure (perhaps nominally a Cueball character) has had the audacity or thoughtlessness to obtain a black hat, for whatever reason. Black Hat learns of this and responds by similarly

adding to his normal apparel, just to make a non-verbal point that could be a passive-aggressive sign of displeasure or merely from his usual wry sense of amusement.

This comic is also a metatextual joke about xkcd itself. Because of the comic's simplistic art style and characterization, Black Hat has only two defining physical traits: his hat and his hair, which we see when he takes off his hat, and one defining personality trait, his malevolence. Randall then implies that the two traits must be correlated, so that a black hat signifies malevolence, and accordingly two hats must signify even more malevolence -- an idea that wouldn't make any sense in real life, where a person with two hats would just be making an odd fashion choice.[citation needed]

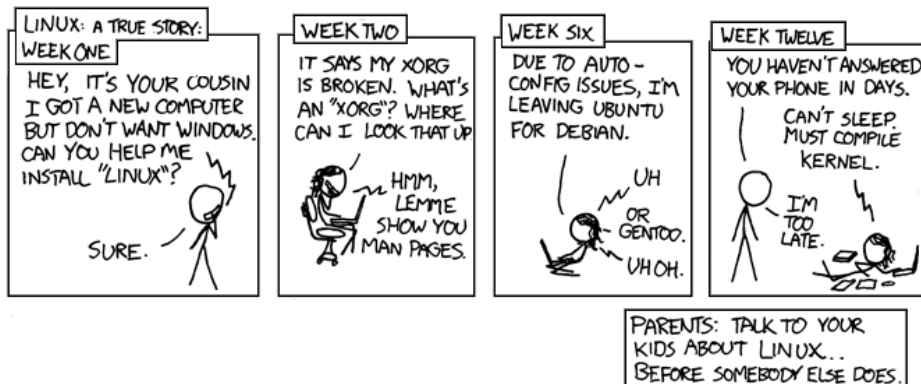
The title text is simply "...". This may represent the slow-motion pause during which Black Hat's nefarious life flashes before his eyes, as he considers his impending doom. It may also emphasize how the usually witty Black Hat is, for once, speechless. Or the title text is similar to that in 412: Startled, where Black Hat also becomes the little one (and with much focus on the black hat, as in this comic). As mentioned there, such a short title text could be due to the fact that it's a somewhat surreal comic, and any further commentary might have detrimentally brought it down to Earth. See also 82: Frame, with the same title text, but no relation to black hats.

Two Black Hats makes a reappearance in 826: Guest

Week: Zach Weiner (SMBC), down by the restrooms.

#456: Cautionary

July 30, 2008



This really is a true story, and she doesn't know I put it in my comic because her wifi hasn't worked for weeks.

Explanation

Cueball's cousin decides to install Linux on her new PC, and calls Cueball, whom she views as her personal Linux expert. The overarching joke revolves around the fact that Linux, especially home PC-based GNU/Linux, was (at the time of this comic's publication in 2008) much more often used as a "hobby" OS, as compared against a "productivity" OS such as Windows or macOS. Large numbers of people use Windows or Mac by default, because it came with their computer hardware when they bought it, and it already had the software suite they wanted to use installed along with it. Linux, on the other hand, rarely comes pre-installed on PC hardware and generally must be deliberately chosen and acquired. While it can be set up to achieve efficient and productive workflow in virtually any area on PCs, because it often must be consciously selected, installed, and configured by users, it tends to either attract or, in a few cases, create individuals who take disproportionate pleasure in, and derive self-identification from, hacking the operating system itself. Thus, many people who are Linux enthusiasts began by not really knowing anything about it other than that it's free of cost, but the process of actually building Linux on their machines gradually led them to take an increasing interest in it, which the comic humorously likens to substance addiction.

Xorg (officially X.Org) is an implementation of the X Window System, a program responsible for the graphical display used on Linux. If it has configuration problems,

which was quite common with some video card drivers back in 2008 (especially those for ATI Radeon cards), it is often difficult and/or painful to fix (see 963: X11). Man pages are manual pages for Unix-based operating systems and software, usually accessible online but also bundled with the software itself. Considered helpful and clear by the sorts of advanced computer users who typically run Linux, the text-only documentation can seem inaccessible for less-technical users. Here, the joke starts to build in that Cueball's cousin, a computer novice who just wanted something to work out of the box, is now having to learn how to understand Linux documentation in order to fix her ongoing Xorg problem (likely an inability to start a graphical environment, something a novice user would depend on).

In the third panel, we see that the cousin has had new problems. Though she likely has been able to fix Xorg, she is now having problems with Ubuntu's auto-configuration tools. She suggests that she is considering switching to a more advanced Linux distro in order to sidestep the failing autoconfig issues. A Linux "distro" (distribution) is a suite of tools and applications that provides a specific user experience on top of the core Linux operating system. Each distro has a different look and feel and different feature sets and design philosophies. Ubuntu is a very popular "beginner" version of Linux, designed to "just work" and be familiar and usable to people fresh out of Windows. Debian is a popular but somewhat more "advanced," traditionally "Unix-like", distro, with a huge and diverse

base of supported software that generally requires more Linux know-how to configure and use. In fact, Ubuntu is based on Debian, and under the hood they have similar features, so that it would not be considered much of a leap for a competent Ubuntu user to switch. Gentoo, on the other hand, is a very advanced distro allowing for extreme customization and optimization, but requiring extensive install and setup time. It is generally considered to be complex and beginner-unfriendly (to the point that its difficulty has become somewhat memetic in the Linux world), a trade-off for providing a powerful and versatile set of tools for advanced system hacking. It appears that during the past four weeks, Cueball's cousin has started to consider that solving her problem would require complex tweaking.

In the fourth panel, it appears that the cousin has indeed switched to Gentoo, because a hallmark of that distribution is that the kernel (the basic core of the operating system) must be compiled from source code upon installation. Source code is a computer program expressed in human-readable text; however, source code cannot be run directly by a computer, and instead needs to be compiled into low level machine instructions the computer can understand. This means that with Gentoo, instead of downloading an already functional Linux system to install and run, users download the source code for the system, customize it to their own needs, then compile the code into an executable version of the OS, all before they can begin to use the system. Reasons that the cousin may want to do this include

needing the kernel to be compiled in a non-standard way that is not supported by more mainstream distros, or incorporating third-party code or even her own modifications into the kernel. Compiling a kernel with the aforementioned modifications is a tricky affair, since any mistake or oversight can render the kernel, and thus operating system, non-functional, requiring the custom kernel to be anew. This panel implies that this has indeed happened, with the cousin compiling the kernel over and over again for days without sleep. To many such advanced users, their installation of Linux is like a hobby car: a project to be constantly tweaked and adjusted to fit one's exact needs, that spends as much time sitting around with its hood open as it is actually used for its ostensible purpose. By week 12, it is likely that Cueball's cousin has totally forgotten about her original plans for the computer and has become obsessed with Linux in a way that Randall compares with drug addiction for comic effect.

Similarly, in the fifth panel, Randall riffs on the old anti-drug message "Parents, talk to your kids about drugs before someone else does," with the meaning being if a responsible adult does not educate their kids about the dangers of drugs (or Linux), then someone else (likely a peer) might convince them that drugs (or Linux) is a good idea. There is an additional call to the theory of gateway drugs, where mild drugs like alcohol or cannabis will lead to harder drugs like cocaine and heroin. In the comic, Cueball's cousin starts out with Ubuntu, a "gateway" version of Linux, which leads to Gentoo, a

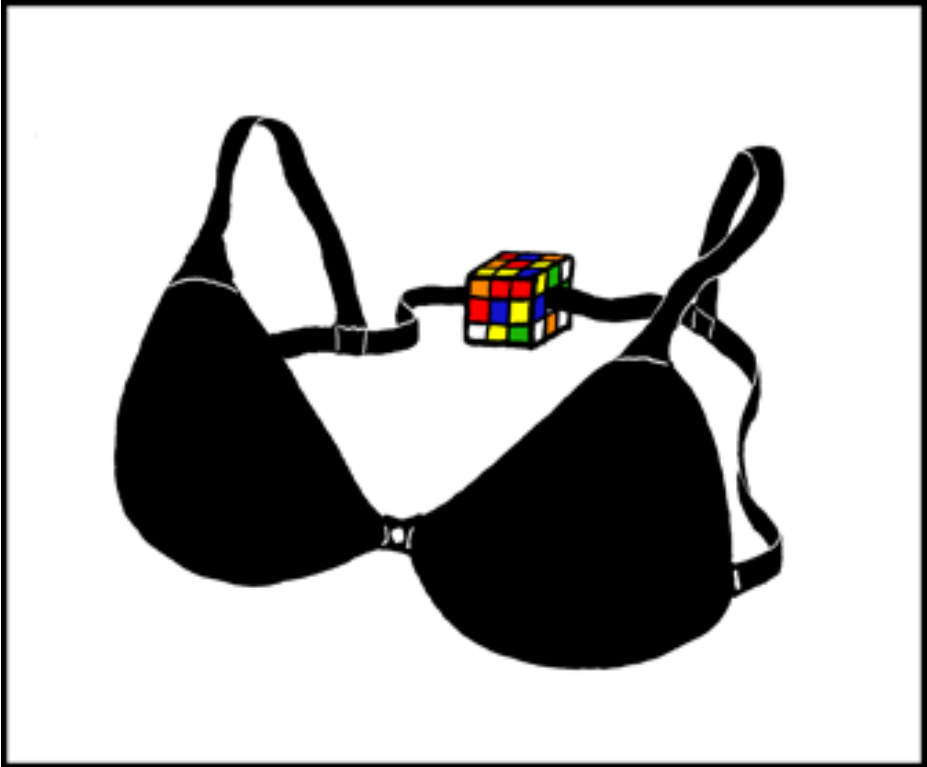
harder, more niche version, with the end result being her vanishing for weeks inside her house, compiling her kernel, like a junkie hopelessly hooked on drugs.

The title text continues the joke about Linux's poor support for many Wi-Fi cards common in 2008, a device that is not only well supported on Windows, but was typically seen as making networking easy for less technical users.

While the comic sarcastically pokes fun at the difficulties in using Linux (circa 2008), it also indirectly shows some of its advantages. The first one is that it is a freely available alternative to Windows; the second is that it provides users the tools to make fixing problems possible, whereas with Windows, the only problems that are fixed are the ones Microsoft chooses to fix; and the third is that it can increase one's knowledge of one's own computer, as the cousin, who barely seems to know how computers work past very basic end-user functionality, has become extremely advanced after several weeks. The comic is also somewhat anachronistic, as over time, hardware support in Linux has become much more robust; it is currently unlikely that Cueball's cousin would experience broken graphics or wind up in kernel compile hell to enable basic functions such as Wi-Fi.

#457: Frustration

August 01, 2008



'Don't worry, I can do it in under a minute.' 'Yes, I've noticed.'

Explanation

A bra is pictured here, but instead of a traditional clasp, a Rubik's cube is used instead. The comic is a metaphor for how many men (and potentially women who don't wear bras) have difficulty removing their woman lover's bra before sex.

Women who wear bras are going to be quite adept at unhooking their bras simply due to experience and muscle memory. However, many common bra clasps are unique to bras and aren't found on other clothing, so their bra-less lover, lacking that experience, might fumble with the clasp for quite some time. In the heat of the moment, a lover may feel frustrated if they feel that the act of removing a bra is needlessly complicated and distracts from the activity at hand (namely sex). Depending on the clasp mechanism, attempting to remove the bra may seem as frustrating (hence the comic title) and complicated as solving a Rubik's cube.

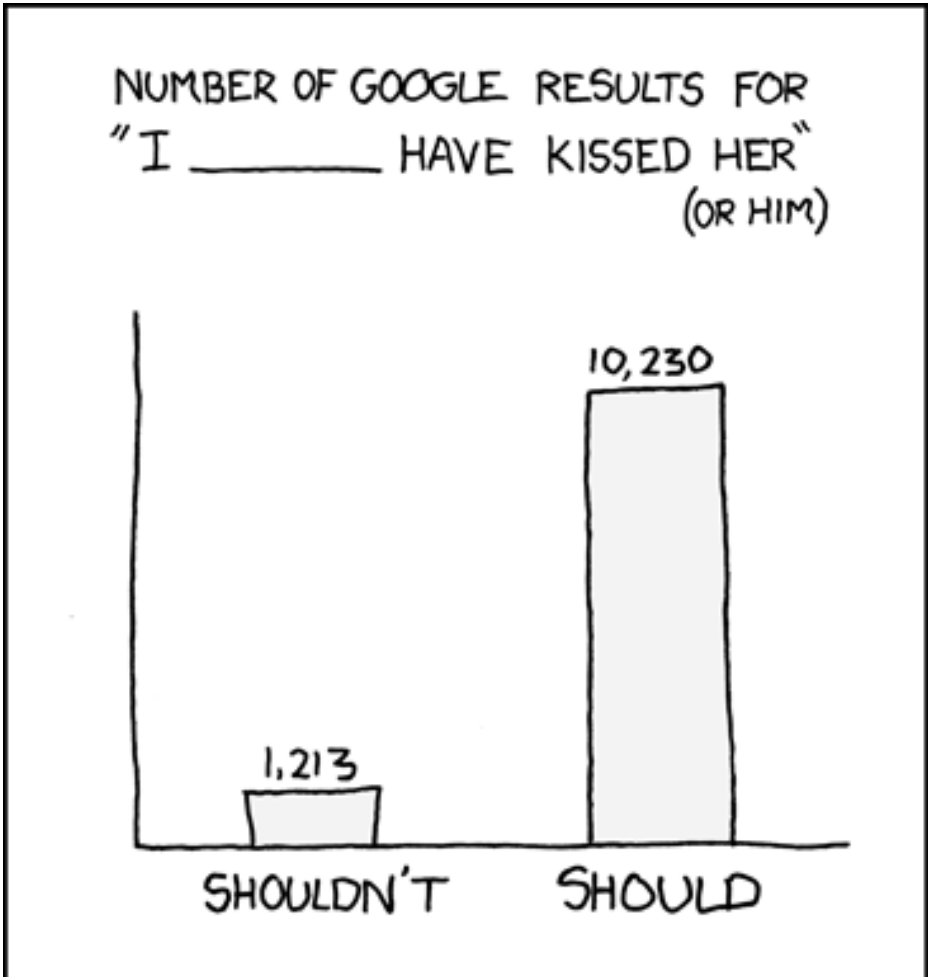
A literal bra clasped with a Rubik's cube would doubtless be especially frustrating, as someone wishing to remove the bra would have to solve the Rubik's cube every time in order to undo the clasp. This would doubtless prove annoying, especially for a partner who may want to remove the wearer's clothing without impediment. A normal bra clasp can be tricky enough for the inexperienced user, but the addition of the Rubik's Cube element is going too far. Not to mention, such a bra would doubtless be highly uncomfortable for the

wearer.[citation needed] However, it is possible that this is actually a nerdsnipe bra, as it appears to be a front-clasped bra, making the Rubik's cube a red herring.

The title text is an imagined conversation between someone trying to undo this bra and someone who is likely wearing the bra. The first person explains that they can "do it" (i.e. undo the bra) in under a minute, which is a reasonably impressive skill to have if you are not a professional speedcuber. The second person replies that they've noticed, a sarcastic reply that relies on the alternative, sexual meaning of "do it," implying a complaint about the first person's speedy performance in bed.

#458: Regrets

August 04, 2008



And nothing for 'I'm glad I saw Epic Movie.'

Explanation

The comic is a bar graph that shows more people regret having not pursued/kissed a love interest than regret having pursued/kissed one.

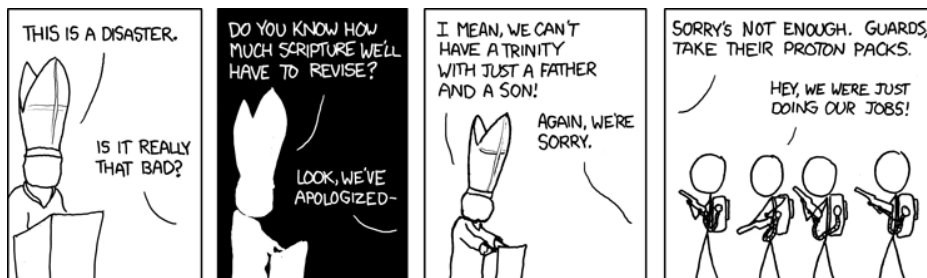
It should be noted that as of June 20, 2023, the position has reversed: there are about 55.4 million results for "I should have kissed her" and 57.5 million for "I shouldn't have kissed her."

The title text refers to the Friedberg and Seltzer movie *Epic Movie*, a "comedy" movie that received overwhelmingly negative reception, and is widely considered one of the worst movies ever made. In referencing that movie, Randall agrees with that opinion and expresses the theme of regret in a completely different context by suggesting that people who watched the movie overwhelmingly regretted doing so.

After this comic was released, the search results for "I'm glad I saw *Epic Movie*" at Google did grow up to more than 8,000 results.

#459: Holy Ghost

August 06, 2008



Okay, everyone, cross yourselves, then cross the streams.

Explanation

The majority of Christian sects (including Roman Catholicism) profess belief in the conception of a singular God wherein there is a mysterious unity of three distinct 'persons' who share in one another's divinity, in a concept called the Trinity. The three persons are conventionally called the Father, the Son, and the Holy Spirit — but in more archaic English usage, the third person was referred to as the Holy Ghost.

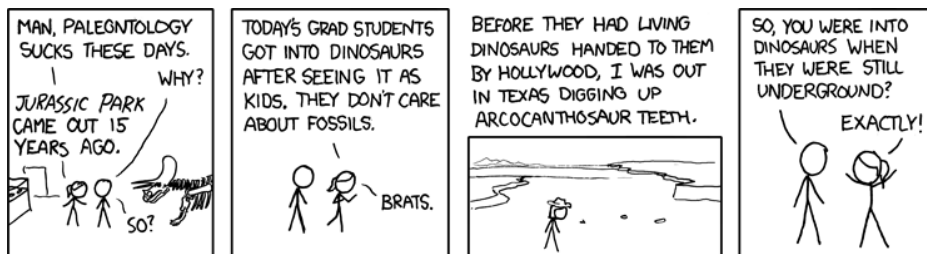
The 1984 movie Ghostbusters was based on the premise that ghosts exist and that four unemployed men had access to technology that could trap such ghosts. These men formed a business as Ghostbusters, and an important tool in their arsenal was a so-called "proton stream" powered by a wearable backpack. These streams would prod or stun ghosts, allowing them to be maneuvered into traps. Throughout the movie, the Ghostbusters reminded each other 'not to cross the streams', as this was supposed to cause a disastrous reaction, until the climax of the movie where crossing the streams was required to banish the main antagonist.

Here we see that the Ghostbusters have apparently just encountered and eliminated the Holy Ghost, and are being taken to task by the Pope, the leader of the Roman Catholic Church. He points out that much of Christian theology is grounded in the doctrine of the Trinity and is unwilling to accept the Ghostbusters' apology.

The title text is a play on a short Catholic prayer called the Sign of the Cross (the physical motions of which involve touching the forehead, chest, and shoulders), the practice of which is colloquially called 'crossing oneself', and on the danger of the Ghostbusters' 'crossing the streams' and touching two proton streams together, which in Ghostbusters canon causes an explosive chain reaction in all nearby atoms.

#460: Paleontology

August 08, 2008



Dinosaurs totally jumped the ichthyosaurus when they got rid of Brontosaurus.

Explanation

This comic is essentially a set up for a pun: "Underground" can mean "under the ground" (buried in the dirt) or "non-mainstream." In this case, Ponytail is whining that she had been doing paleontology before Jurassic Park kicked paleontology into the mainstream with living reproductions of dinosaurs, thus apparently undermining the hard work paleontologists had done. In other words, this comic is also poking fun at hipsters.

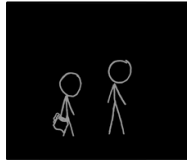
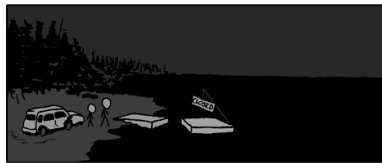
The title text refers to the controversy of calling the Brontosaurus by its newer, correct (at the time) generic name of Apatosaurus, despite its previous name still being in mainstream use long after its taxonomic redefinition in 1903. (As of 2015, Brontosaurus is once again the correct generic name, as it has been reclassified as a distinct genus.) The title text claims that this renaming has "jumped the ichthyosaur," which is a play on the idiom "jumping the shark" — i.e. that the subject of dinosaurs has reached a point of declining relevance, and Brontosaurus has been renamed as a publicity stunt to compensate. The "shark" in the idiom has been replaced by an "Ichthyosaur," which was a marine reptile that resembled a shark or dolphin and lived alongside dinosaurs during the Mesozoic era (although sharks also lived during that time). 636: Brontosaurus also references the Brontosaurus name change. A Brontosaurus also appears in 15: Just Alerting You and an Apatosaurus in 650: Nowhere.

#461: Google Maps

August 11, 2008

MY ROAD TRIP WITH MY BROTHER RAN INTO TROUBLE
AROUND PAGE THREE OF THE GOOGLE MAPS PRINTOUT:

70.	STRAIGHT LEFT AT RT-22.	GO 6.8 MI
71.	TURN RIGHT TO STAY ON RT-22.	GO 2.6 MI
72.	TURN LEFT AT LAKE SHORE RD.	GO 3/2 FT
73.	TURN RIGHT AT DOCK ST.	GO 427 FT
74.	TAKE THE FERRY ACROSS THE LAKE.	GO 2.8 MI



74.	TAKE THE FERRY ACROSS THE LAKE.	GO 2.8 MI
75.	CLIMB THE HILL TOWARD HANGMAN'S RIDGE, AVOIDING ANY MOUNTAIN LIONS.	UP 1,172 FT
76.	WHEN YOU REACH AN OLD BARN, GO AROUND BACK, KNOCK ON THE SECOND DOOR, AND ASK FOR CHARLIE.	GO 52 FT
77.	TELL CHARLIE THE DANCING STONES ARE RESTLESS. HE WILL GIVE YOU HIS VAN.	CAREFUL
78.	TAKE CHARLIE'S VAN DOWN OLD MINE ROAD. DO NOT WAKE THE STRAW MAN.	GO 11 MI
79.	TURN LEFT ON COWSTOCK. WHEN YOU FEEL THE BLOOD CHILL IN YOUR VEINS, STOP THE VAN AND GET OUT.	GO 3.2 MI
80.	STAND VERY STILL. EXITS ARE NORTH, SOUTH, AND EAST, BUT ARE BLOCKED BY A SPECTRAL WOLF.	GO 0 FT
81.	THE SPECTRAL WOLF FEARS ONLY FIRE. THE GOOGLE MAPS TEAM CAN NO LONGER HELP YOU, BUT IF YOU MASTER THE WOLF, HE WILL GUIDE YOU. GODSPEED.	GO ?? MI

Apparently Google assumes you're traveling during the ferry's normal operating hours. We lost two hours circling that damn lake (to say nothing of the Straw Man).

Explanation

Google Maps (Check it out [here](#)) is a web mapping service application. Before smartphones with GPS mapping software were widespread and most people's printers hadn't yet run out of ink, it was common to print out directions to take with you on a trip. The web version of Google Maps has many features including a route planner. As sophisticated as early versions were, it occasionally gave suboptimal directions. For example, the directions may tell you to take an exit that, in reality, is unmarked. Directions also did not take time of day into account, which would help in planning routes to avoid traffic or to make use of services such as a ferry.

Though no specific game or movie is referenced, steps 75 to 81 of the directions read like the plot of a horror film, a guide of a video game, or a role playing game. A straw man is another term for scarecrow, a common antagonist in both. Step 80 reads exactly like an old text adventure game's description of an area.

There are additional small jokes in the distance column of the directions:

- Step 75 tells you to travel 1172 feet up, a direction that Google Maps doesn't normally take into account.
- No distance is traveled in step 77, so Google instead tells you to be careful when talking to Charlie.
- Pi (π) is a ratio usually used in calculations involving

circles, rather than in measuring distances.

- Google doesn't know how far it is from the Spectral Wolf to your destination, so it gives you question marks as the distance.

This might be a reference to Google Maps' many easter eggs.

The title text tells us that Cueball and his brother attempted to drive around the lake, since they could not take the ferry. It seems they also had an unfortunate run-in with the Straw Man, apparently waking him as the directions warned against.

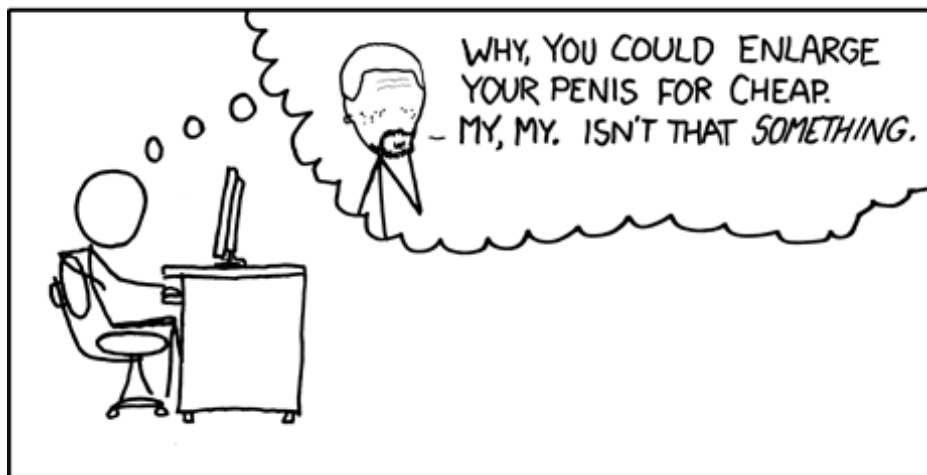
Directions[edit]

#462: Freemanic Paracusia

August 13, 2008

FREEMANIC PARACUSIA:

A DISORDER WHEREIN YOU HEAR EVERYTHING YOU READ
IN THE COMFORTING VOICE OF MORGAN FREEMAN.



It's amazing what it does for YouTube comments.

Explanation

Paracusia is a form of hallucination that involves perceiving sounds without auditory stimulus.

Morgan Freeman is an American actor who may be best known as the character Red in *The Shawshank Redemption*, where he is also the narrator. He narrates because he is especially known for his soothing and mellow voice, which helps him amplify performances in minor parts, such as God in *Bruce Almighty*. He has been a narrator of many TV programs and also narrated the major film *War of the Worlds* where he did not play any other part.

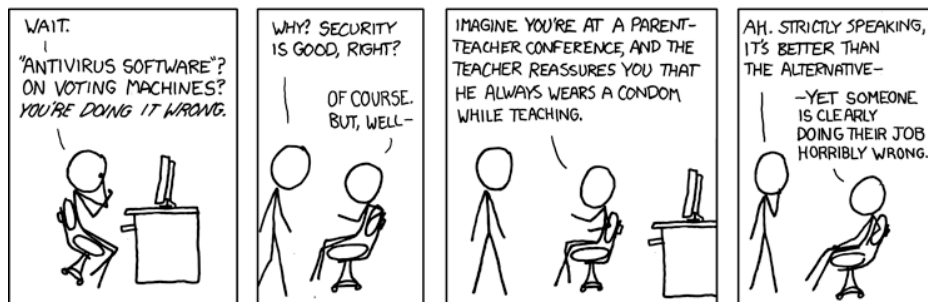
The comic is a play on the combination of the two. The idea is that while reading a text, instead of hearing your own voice in your mind's ear, you substitute it with Freeman's voice, giving a new perspective on the contents of the text. Here, the voice of Morgan Freeman converts the most annoying possible thing on the web (penis enlargement advertisements) into a soothing meditation.

The title text suggests to apply this specifically on the mostly stupid comments on YouTube, like those found in 202: YouTube.

#463: Voting Machines

August 15, 2008

PREMIER ELECTION SOLUTIONS (FORMERLY DIEBOLD)
HAS BLAMED OHIO VOTING MACHINE ERRORS ON PROBLEMS
WITH THE MACHINES' MCAFEE ANTIVIRUS SOFTWARE.



And that's *another* crypto conference I've been kicked out of. C'mon, it's a great analogy!

Explanation

In the 2008 Ohio primary elections, there were numerous problems with electronic voting machines, which eventually required many districts to revert to pen and paper. Premier Election Solutions, the company that handled the machines, blamed these problems on McAfee antivirus software. (The comic likely emphasizes the fact that Premier Election Solutions was formerly known as Diebold because Diebold voting machines had previously become infamous in the United States for their poor security during the 2004 and 2006 elections, and the company changed its name to distance itself from this bad reputation.)

It is not uncommon to see computer software contracts stipulating that the vendor will warrant that software and systems delivered will not contain any viruses or malicious code ("malware") — a knee-jerk reaction to this is for novice management to include malware-scanning "antivirus" software for systems that otherwise are closed. From a computer programming standpoint, having antivirus software on an electronic voting machine doesn't make sense, because ideally the machine shouldn't be connecting to anything external (eg the internet, USB, a local network, removable drives, bluetooth...) that would leave it open to malware attacks. While there are many ways that malware can reach a computer, ultimately the computer still has to run executable code that was not distributed with it in the first place, which is something that no election machine

should encounter in normal operation. Hence, the question is whether the voting machine manufacturer has taken the proper precaution preventing any external access.

Ideally, voting machines (as well as ATMs and other single-purpose appliances) should be embedded systems, supposedly making them incapable of doing the things that might necessitate antivirus software. However, in practice, such devices are more commonly built as application programs running on ordinary Windows PCs (inside of custom-shaped cases), and they download software updates over the internet, synchronize voting data to a single "Ballot Box" server over a local network, use USB peripherals which could potentially be replaced by a bad actor, etc. And even embedded systems are vulnerable to many classes of malware.

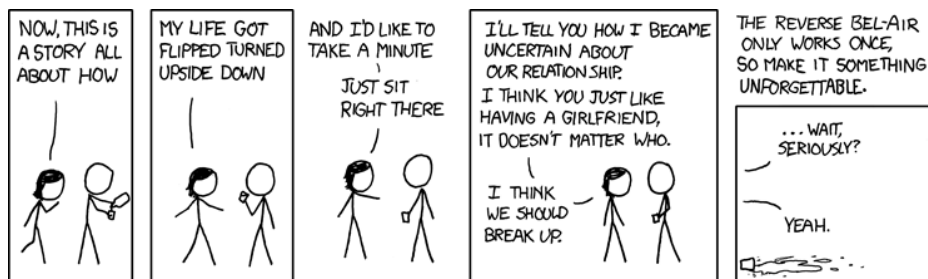
The comic makes an analogy to a teacher who reassures you that he always wears a condom when teaching. While a condom could be considered "protection," and therefore a good thing, common sense dictates that teachers should never end up in a situation where wearing a condom in school would be useful; this parallels the idea that while security in the form of antivirus software on voting machines could also be considered protection and a good thing, it should never be required. The comment is more likely to make people worried about why the condom is there and what purpose it's serving. Similarly, informed people might worry why a voting machine has any access to malicious executable code.

In panel one, both the facepalm and "You're doing it wrong" are Internet memes, used to mock someone who made a foolish mistake.

The title text refers to 153: Cryptography. Voting software is also featured in 2030: Voting Software.

#464: RBA

August 18, 2008



This is a story all about how I started drinking.

Explanation

A Bel-Air is an internet meme where a poster on a message board starts a post on a serious topic, but partway through the post switches to reciting the lyrics to the opening theme song of *The Fresh Prince of Bel-Air*, a 1990s sitcom starring Will Smith (previously known in his rapping career as the "Fresh Prince") as a street-smart teenager from West Philadelphia who has been sent to live with his affluent and stuffy Aunt and Uncle in Bel Air, Los Angeles by his mother as a consequence of a single altercation with a couple of no-good guys who were making trouble in his previous neighbourhood.

Megan in the comic reverses the traditional arrangement by starting the conversation with a recitation of the lyrics to said theme song, and then switching partway through to a very serious discussion of the status of their relationship culminating in a break-up.

The lyrics go like this:

The title RBA is an acronym for Reverse Bel-Air.

The title text is also an RBA, but one that diverges from the song lyrics much more quickly. It's a play on the phrase "started drinking." This phrase usually refers to someone becoming an alcoholic (in this case, it would be because of the break-up), but in this case refers to the actual fact that Cueball had just started drinking (likely a

glass of water) when Megan started talking to him.

A similar (though less serious) play on the Bel-Air meme was later used in 1059: Bel-Air.

#465: Quantum Teleportation

August 20, 2008



Science should be exactly as cool as the headlines sound. Like the 'RUSSIANS CUT APART AND REASSEMBLE DOGS' thing.

Explanation

Quantum teleportation is a method of effectively taking a quantum state that exists in one laboratory and destroying it in the current laboratory and later recreating exactly the same — still unmeasured — quantum state in another laboratory that could potentially be very far away.

This is achieved by first creating an entangled quantum state in a laboratory and moving one part of the entangled quantum state to a faraway laboratory. Now let's say a scientist desires to teleport the quantum state $|\psi\rangle$ to a faraway lab. The scientists does a specific measurement on the combination of $|\psi\rangle$ and their half of the entangled quantum state, and the outcome of their measurement will be two bits of classical information. They can then telephone over the results of their two bits of information to tell scientists at the faraway lab how to do a measurement on their half of the entangled quantum state, which will recreate the quantum state $|\psi\rangle$ at the faraway lab, effectively teleporting it. This is an important result in quantum mechanics, especially in regards to quantum computing.

The name is misleading in that it does not create an efficient means of transportation via teleportation — something like the teleporters from Star Trek i.e. a conventional teleporter — where macroscopic objects like humans (composed of 7×10^{27} atoms) could be teleported to an arbitrary place.

The comic jokes with the fact that news reporters wish to get a story about Star Trek teleporters, and the scientist is angry that there is no interest in his quantum version — the reporters are even disappointed when they write their story. The last panel appears to indicate that this scientist not only has a quantum teleporter, he also has a "regular" teleporter of the type the reporter is asking about, which would be a gigantic news item, as it is one of the biggest challenges of this century (and possibly future ones as well) to build one. He uses the conventional teleporter to escape to The Bahamas.

The whole method of quantum teleportation is predicated on being able to first create entangled quantum states and then transport, by conventional means, one-half of the entangled state. Only after this step could you then destroy the shared entangled quantum state, to "teleport" a different quantum state to the new location.

Quantum teleportation is deeply related to Bell's theorem where it's shown that quantum mechanics is incompatible with the idea of local hidden variables and that has been experimentally demonstrated (though a few very small loopholes still have not been conclusively ruled out). Explaining "it's a particle statistics thing" is a great explanation of the related Bell's theorem experiments, which demonstrate quantum entanglement, which is at the root of quantum teleportation. In these experiments, physicists take an entangled quantum state, move it apart, and then randomly decide which direction to measure each side of

the quantum states. Through a statistical analysis of the results, you can demonstrate and measure each entangled particle in a randomly chosen direction. The statistical correlations between the particles are consistent with quantum mechanics and inconsistent with any local hidden variable theory; however, this instantaneous wave-function collapse does not break special relativity as wave-function collapse does not allow communication of any information. Instead, you can just analyze the correlations after the fact and compare the hypothesis of local hidden variables to the inconsistent hypothesis predicted by quantum mechanics and verify the quantum mechanical prediction.

In the comic, Cueball explains to the reporter that quantum teleportation isn't what reporters build it up to be, before Cueball successfully teleports by switching his teleportation machine from quantum teleportation to regular teleportation.

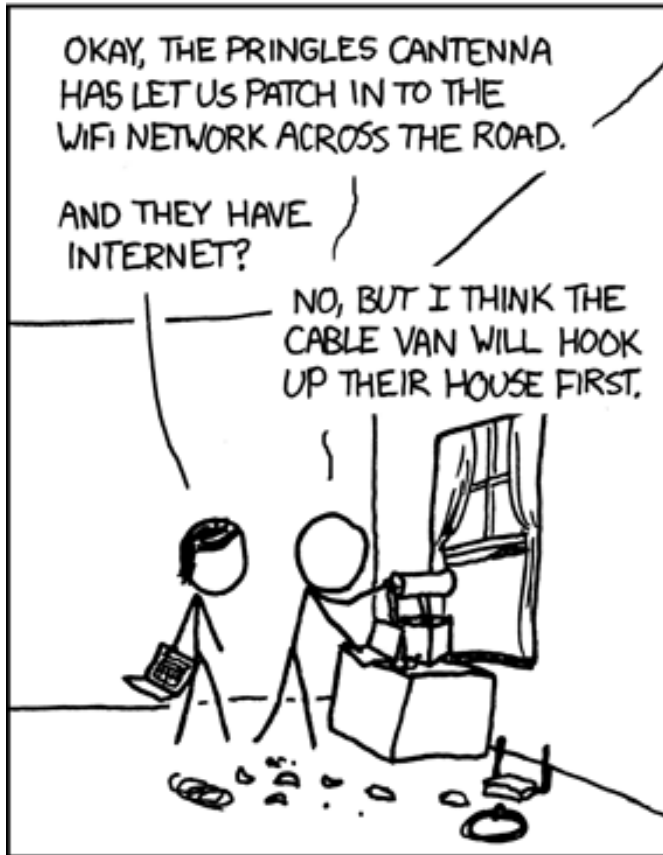
The title text refers to the controversial 1940s Soviet Experiments in the Revival of Organisms video that depicts a dog's head being cut off and revived. The film is controversial in that the footage is often perceived as being staged, though the Soviet scientist depicted in the video was attempting these sorts of experiments, and this research eventually led to the first Soviet open heart operation in 1957 — another instance of crazy headlines that may not be as interesting to the public when first explained, but may be an important step on the way to some type of practical use. Cutting apart and reassembling dogs could also be a metaphor for quantum

teleportation if it were used to transfer dogs' states from a group of particles in one location to a group of particles in another location, which could be described as taking apart dogs and resembling them in a different location, although the word cut would be inaccurate. If this is the case, then Randall is arguing that this particular piece of science is as cool as it seems (because the objects are disassembled then resembled into someone else, as opposed to simply being moved); the reporters are merely disappointed because they were expecting something else.

#466: Moving

August 22, 2008

THERE ARE FEW FORCES MORE POWERFUL
THAN GEEKS DESPERATELY TRYING TO GET
INTERNET IN A NEW APARTMENT.



We need a special holiday to honor the countless kind souls with unsecured networks named 'linksys'.

Explanation

The caption notes that few forces are more powerful than a geek trying to get Internet in a new apartment, thus explaining the title of the comic: Moving. One of the consequences of moving one's place of residence is having to arrange connection to various essential utilities, including the internet. One way to reduce the time where such utilities are unavailable is to steal them off your neighbors. As geeks prioritize access to internet over common human values, they are more likely to access other's internet via such underhanded means.

A cantenna is a do-it-yourself antenna made from a can, in this case a Pringles can. Cueball is pointing his cantenna to the neighbors across the road, which, as he says, will allow him to connect to the Wi-Fi network there.

Megan asks if the neighbors themselves have internet access, to which Cueball answers that they don't, but he thinks that they will get hooked up to the internet first. Potentially this is because they are more likely to pay for their internet access rather than hacking someone else's.

The title text continues this theme of connecting to other people's networks, noting that we should have a holiday in honor of those people who don't bother reconfiguring their Linksys routers (thus leaving them with the default name of 'linksys'; this was very common when this comic was published in 2008), which allows

other people to connect to those networks very easily, as they aren't encrypted by default and don't need a password.

#467: X Girls Y Cups

August 25, 2008

GOOGLE RESULTS FOR "<x> GIRLS <y> CUPS"

		CUPS							
		0	1	2	3	4	5	6	7
GIRLS	0	3	375	9	0	0	0	0	0
	1	7	7503	2007	10	5	3	6	2
	2	9	229,000	247	7	14	13	2	1
	3	7	6335	394	34	3	2	6	0
	4	3	3513	34	0	63	0	0	0
	5	1	9	5	3	0	0	3	0
	6	3	1461	1	1	1	0	0	0
	7	2	19	4	2	0	0	0	0

Also no results: 1girl10000cups, 2girls(5+3i)cups,
65536girls65536cups, or 3frenchhens2turtledoves1cup.

Explanation

The comic refers to *Hungry Bitches*, a 2007 scat-fetish pornographic film. The one-minute preview, unofficially nicknamed "2 Girls 1 Cup," is a viral video that became a well-known internet meme. It is therefore not surprising that only the input combination of $x = 2$ and $y = 1$ generates a significant number of search results, being 257 times as frequent as the runner-up, "1 Girl 1 Cup."

This table is an example of a rudimentary heat map. The cells in the table with zero hits are white. From 1 to 9 they are yellow, and above that they are orange — except the maximum, which is red. As the second largest count is below 10,000 (7503) and the maximum almost two million, it is impossible to say if the red color is reserved for the maximum or for any number above a given value, say from ten thousand or up to above a million hits.

The title text suggests other combinations like 1 girl to 10,000 cups (very large number of cups to one girl), 2 girls to $(5 + 3i)$ cups (a complex number), 65536 girls to 65536 cups (216, the first integer that can't be represented as a two-byte unsigned integer), and finally 3 French hens and 2 turtle doves to 1 cup. All are phrases with apparently no search results.

The last phrase is a reference to the song "The Twelve Days of Christmas." After the publication of this comic, the phrase has been cross-posted at various sites in order to generate search results and prove the statement in the

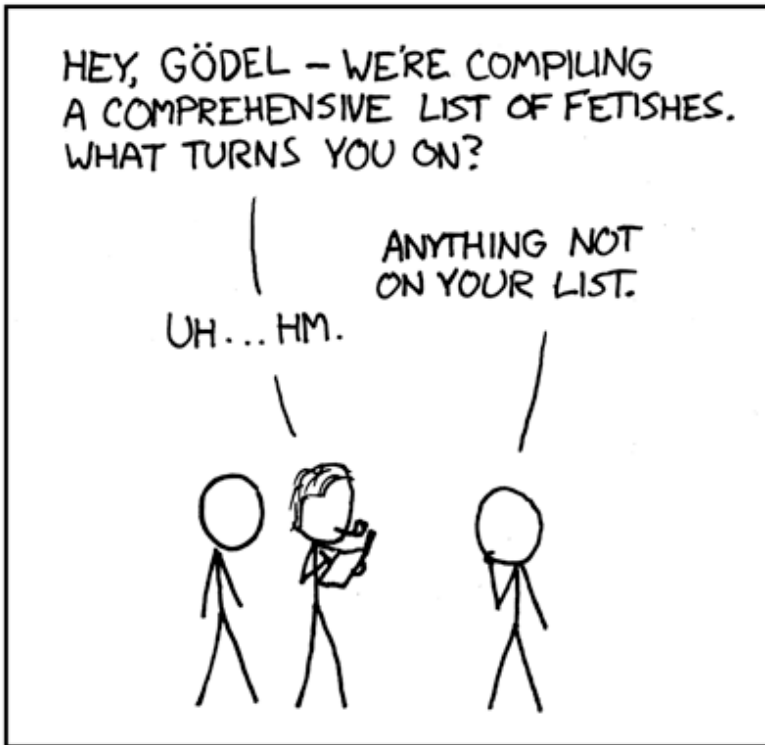
title text wrong. The same has happened to other entries, as it often happens shortly after Randall posts something regarding Google searches.

#468: Fetishes

August 27, 2008

AUTHOR KATHARINE GATES RECENTLY ATTEMPTED
TO MAKE A CHART OF ALL SEXUAL FETISHES.

LITTLE DID SHE KNOW THAT RUSSELL AND WHITEHEAD
HAD ALREADY FAILED AT THIS SAME TASK.



They eventually resolved this self-reference, but
Cantor's 'everything-in-the-fetish-book-twice' parties
finally sunk the idea.

Explanation

Bertrand Russell and Alfred North Whitehead co-wrote the *Principia Mathematica*, with the intention of cataloging all of mathematics and ridding it of contradiction and self-reference. Kurt Gödel later showed that such a system is impossible, and that any system of axioms (complex enough to represent arithmetic) is incomplete.

This comic, however, presents an alternate universe scenario: here, Russell and Whitehead are pursuing the more salacious (but no less comprehensive) task of compiling a list of all sexual fetishes. This seems to be going fine until they ask Gödel for his fetishes; Gödel says that he is turned on by "anything not on your list." This creates a paradox: Russell and Whitehead now have no way to complete their list, because Gödel's fetishes cannot be included without putting them on the list, which would immediately invalidate them. In fact, this is precisely Russell's Paradox, discovered by Bertrand Russell himself.

The title text references Georg Cantor, the inventor of set theory, and adds a second, similar paradox: if you have a fetish for doing everything in the book twice, then that belongs in the book - but then, you must also have a fetish for doing that twice, so you have to put that in the book too; this process will keep adding fetishes to the book ad infinitum, again making the task impossible to complete.

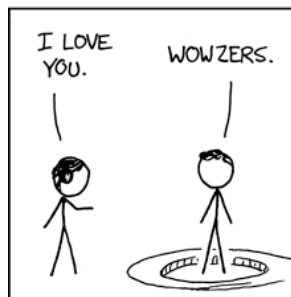
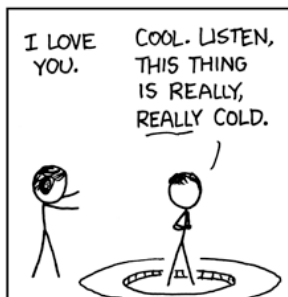
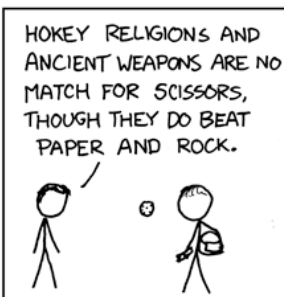
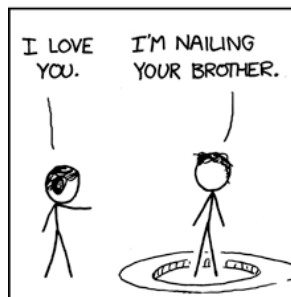
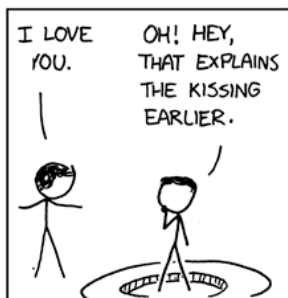
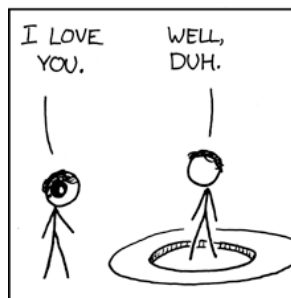
There is a fetish roadmap (archive.org) by Katharine Gates, author of Deviant Desires and DeviantDesires.com.

An earlier comic also refers to Kurt Gödel: 24: Godel, Escher, Kurt Halsey.

#469: Improvised

August 29, 2008

HARRISON FORD FAMOUSLY IMPROVISED HIS "I KNOW" LINE IN ESB. HERE ARE A FEW OF HIS LESS-SUCCESSFUL AD-LIBS:



Oh, your brother is Luke. Sorry, should've mentioned that first.

Explanation

In the second of the original Star Wars film Star Wars Episode V: The Empire Strikes Back (abbreviated "ESB" in the comic), just before Han Solo, portrayed by Harrison Ford, is frozen in carbonite, the following conversation occurs:

The original script had Han Solo respond to Leia with "I love you, too," but Harrison Ford felt that the character would not give such a cliched response, even in the face of likely death. He and the director Irvin Kershner changed the line to "I know" before filming. They did, however, also film the scripted version, but it was the "I know" version that was actually used in the finished film.

This line is generally thought to be better than the original would have been. It was long thought that Harrison Ford ad-libbed the line. Others have even suggested it was because they had filmed the scene so many times, that Ford in exasperation at some point just blurted out the "I know" after hearing "I love you" so many times. But it has later been revealed that it was not ad-lib on the spot, although Harrison did suggest the I know line to the director. This has been described here: [How the Famous 'I Love You/I Know' Scene From 'The Empire Strikes Back' Really Came Together.](#)

The comic presents several alternative ad-libs that Ford could have made in that conversation, as well as at various points throughout the original trilogy. So in this

situation, it is the actor Ford and not Han Solo who speaks the lines.

Note: although it's spelled "wookie" in the comic, the canonical spelling of Chewbacca's species is "Wookiee".

The title text continues the ad-lib in panel four. It refers to the plot twist that Luke Skywalker is Princess Leia's brother, which would not be revealed until the next film in the series. How Harrison Ford knows this twist at this point in the story is unknown.

#470: The End is Not for a While

September 01, 2008



I THINK EVERYONE INVOLVED HERE IS CUTE.

Explanation

People show up at protests because they're angry about something and want to use peaceful means or otherwise to effect political change. It's very much a groupthink, "mob" mentality, bringing to mind the credo, "If you're not with us, you're against us."

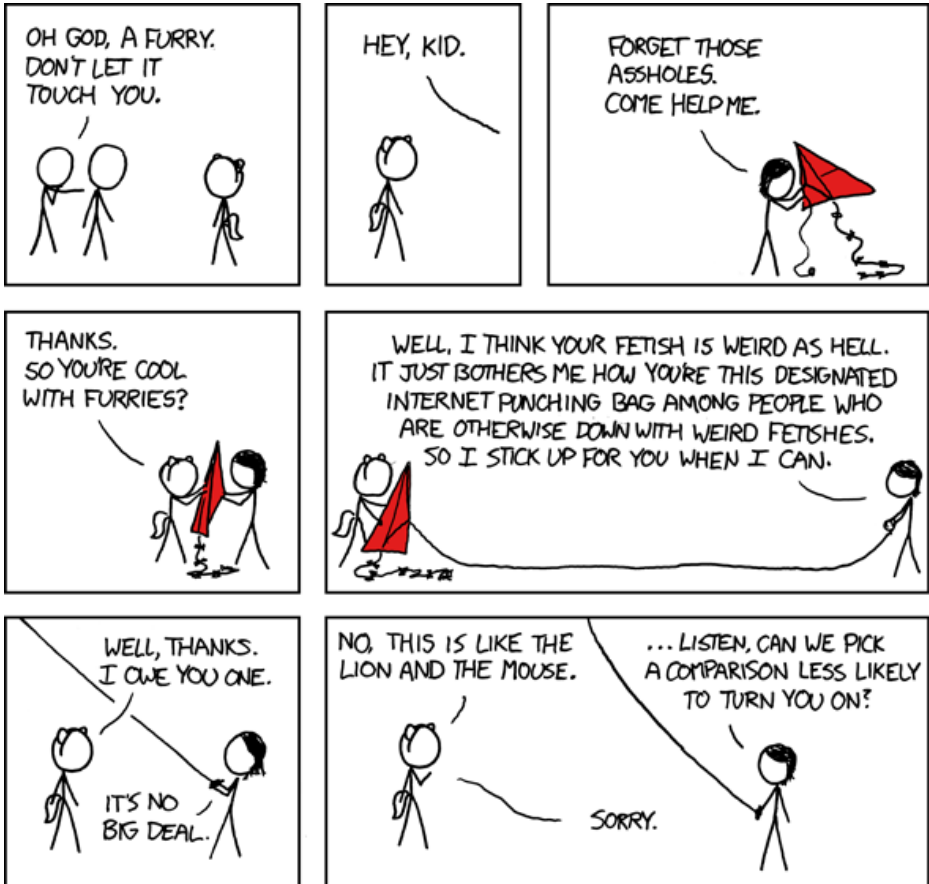
Hardly anyone goes to a protest because they're happy about the way things are, and thus, someone holding up signs saying how happy he is would, to say the least, be very out of place at a protest,[citation needed] although it's more common than expected.

The title text shows another sign Cueball is carrying (although since it compliments the protesters, he may not get in as much trouble for it). It might be a reference to certain protest topic groups that are known for having some members that do not show up because of the protest topic, but show up because of the girls that will be there. (An example of a protest topic is animal rights.)

The title of the comic refers to the oft-seen protest placard "The end is now," signifying that person's belief that we live in the end times, and it's time to start getting right with (insert religious figure of your choice here).

#471: Aversion Fads

September 03, 2008



Hey, are you friends with any hamsters? This kite needs a passenger.

Explanation

A "furry" is a person interested in anthropomorphic animal characters – fictional animal characters that, for example, walk and talk like humans. A common stereotype is that furries role-play their "fursona" ("furry" persona) by dressing up in animal costumes, as demonstrated by the furry in this comic. There are numerous other stereotypes as well, often of a sexual nature, so furries are frequently the target of criticism on the Internet.

In this comic, Cueball and his Cueball-like friend encounter a furry, and react negatively according to the stereotype. In response, Megan kindly invites the furry to help with her kite. Megan explains that, while she too thinks furries are strange, she opposes the hypocritical treatment they disproportionately receive from others who are likely just as strange, and therefore defends furries, given the opportunity.

The furry appreciates Megan's support, comparing it to Aesop's fable of The Lion and the Mouse, in which a lion spares a mouse from being eaten; the lion later becomes caught in a trap, so the mouse repays the earlier favor by chewing through the cords of the trap to free the lion. This simile is meant as a genuine expression of gratitude and indebtedness from the furry, but the joke is that Megan rebukes this specific comparison, as she assumes the furry will be sexually aroused by the animal bondage in the story.

In the title text, Megan asks if the furry has any hamster friends as potential passengers for her kite. She likely means a literal hamster – a rodent that would be small enough to fly on a kite. (This may be a reference to comic 20: Ferret, which also involves a small, flying mammal.) However, this being a furry, she could also mean a human with a hamster "fursona," although this would be too heavy to fly on a typical kite.[citation needed]

#472: House of Pancakes


September 05, 2008

Every day a new city, a new IHOP. And yet every night the dreams get worse. I ply the highways, a nervous eye on the rear-view mirror, the back seat piled with stolen menus. Their doors are opened 24 hours, but forever closed to my soul. This is what my life has become. This is my hell.


INTERNATIONAL

HOUSE OF PANCAKES


[scribble]




Strawberry Banana Pancakes
Four pancakes filled with sliced fresh banana and crowned with cool strawberry topping, more¹⁷ bananas and²¹ whipped topping.
¹⁷Driven by a nameless fear, a whisper in the dark behind me, I flee ahead of I know not what. Whenever I turn, there's nobody behind me. And yet someone is clearly stealing the ketchup. WHY?




Stuffed French Toast
Cinnamon raisin French¹⁸ toast stuffed with sweet cream cheese filling, topped with cool strawberry or your choice of fruit compote and whipped topping.
¹⁸Nightmares again. I wake up covered in sweat, and what seems to be a thin sheen of maple syrup



Rooty Jr.
A kids only¹⁹ version of our house signature Rooty Tooty. One scrambled egg, one strip of bacon, one pork sausage link and one fruit-topped buttermilk pancake.
¹⁹The decision not to hyphenate "kids only" is likely connected to the omission of the serial comma. I wonder if the author is British. I wonder if he sleeps at night.



Rise 'N Shine
Two eggs, toast and hash browns served with your choice²¹ of two strips of bacon or two pork sausage links.
• rent a storage unit.
• Sleep there. Fill it with pancakes. • Leave:



The Big Steak Omelette
Tender strips of steak, hash browns, [redacted] tomatoes and [redacted] Cheddar cheese. Served²² with house salsa.
²²Woke up in Las Vegas. They're closing the Star Trek Experience today. The IHOP up the strip had pancake platters named after various states. None of them sounded like home.

My life is feeding, fleeing, fighting, and forgetting.

ENOUGH WITH YOUR PANCAKES **ENOUGH WITH YOUR GOD DAMN PANCAKES**

[stick figures]

Fuck it. I'm just going to Waffle House.

Explanation

Randall is parodying Mark Z. Danielewski's novel *House of Leaves* by renaming it *House of Pancakes* (after the American fast food franchise International House of Pancakes). *House of Leaves* has an unconventional page layout and style, including the colouring of every instance of the word "house" in blue, as is done on the menu. It includes footnotes within footnotes like Randall did here.

In *House of Leaves*, protagonist Johnny Truant (whose meta-narration is marked by Courier font as mimicked in the comic) discovers a book called *The Navidson Record* (represented here by the pancake menu), which in turn details a film of the same name, which in turn details a horror story of a family living in a sentient house. Truant, who is clearly intelligent and cultured, probes deeper into notating *The Navidson Record*—and into insomnia—until *The Navidson Record* consumes his mind horrifically, the same way the film in the novel consumed the author of *The Navidson Record*, the same way the house in the novel consumed part of the family.

House of Leaves lends itself to many interpretations, but has been called a "satire of academic criticism," which makes this comic essentially a satire of a satire. Since part of the appeal of *House of Leaves* is that it takes itself extremely seriously with its intricacy, multitude of both real and made-up references to academic and popular culture, and layered emotional conflict, Randall's

reduction of the House of Leaves to the (International) House of Pancakes cuts a humorous edge to a dark story. The tone of the comic parodies the tone of House of Leaves: lonely, fear-inducing, and increasingly insane, but using pancakes instead of darkness.

Additionally, the mysterious "Mohawk Girl" referred to in the comic may be a nod to the House of Leaves character Delial, or to 147: A Way So Familiar.

The word "house" is in blue in every instance, which is a stylistic attribute of Mark Z. Danielewski's novel. Every Minotaur reference is marked out in red ink, and every use of "house" or a foreign language's equivalent, such as 'Haus' and 'maison' is in blue. This is not a reference to hyperlinks. It is often thought that the house is printed in blue because houses have 'blueprints.'

The censored portion of the Big Steak Omelette is "...fresh green peppers, onions, mushrooms,..." per IHOP's website for the Big Steak Omelette: "Tender and tasty strips of steak, hash browns, fresh green peppers, onions, mushrooms, tomatoes and Cheddar cheese." Also, Omelette is misspelled, but that's probably just a typo.

The title text refers to the Waffle House, another US restaurant chain. The joke is that the protagonist has decided that maybe all this angst isn't worth it, and he'll just go to a different restaurant.

Clicking on the original comic links to the amazon.com

page for House of Leaves.

From xkcd: volume 0:

#473: Still Raw

September 08, 2008



We actually divorced once over the airplane/treadmill argument. (Preemptive response to the inevitable threads arguing about it: you're all wrong on the internet.)

Explanation

This comic shows Cueball and his significant other undergoing a domestic dispute. The debate is heated, enough to tear apart a romantic relationship, and although the end result is Cueball being thrown out of his other's house, he resolves that he will stand by his point of view no matter what.

Of course, in the last panel, we learn that the argument is over something that should be, in the context of romance, utterly trivial: Cueball has been thrown out simply because he believes that Pluto should never have been a planet.

Pluto was the ninth planet in our solar system between 1930 and 2006, during a time when "planet" had no formal definition. (Jupiter was thought to be the ninth planet from 1807 to 1845.) In 2006, the IAU created a formal definition for "planet"; Pluto didn't make the cut, and it was reclassified as a dwarf planet. The reasons are complicated, but the basic issue is that like Ceres, Pallas, Juno, and Vesta, Pluto is too small to function as a planet in the solar system. A better explanation can be found [here](#). While this is purely an issue of scientific classification, with no real bearing on most peoples' lives, a lot of people have strong opinions on the topic. One on side, people argue that planets should have a consistent and well-defined definition, and Pluto doesn't fit that definition. On the other, Pluto was classed as a planet for long enough that generations grew up thinking of it as

one, and having it removed from the list feels wrong to them. The joke is that both Cueball and his partner were both so emotionally invested in this purely academic issue that it caused an intense argument, resulting in Cueball being thrown out of the house.

In the title text, Cueball reveals that they "divorced once" over the airplane/treadmill argument, suggesting that they were married, divorced, and then reconciled at some point. The argument in question is whether an airplane can take off while it is on a treadmill that is opposing its progress (pulling it backward). The question usually leads to arguments, both because the question may be posed ambiguously and because many people don't fully understand how airplanes work. As with the issue of Pluto, this issue is entirely academic (even more so, as it's purely hypothetical), but people can get very emotionally involved. The joke is that becoming emotionally involved with such debates, to the point of damaging their relationship, is nothing new for this couple.

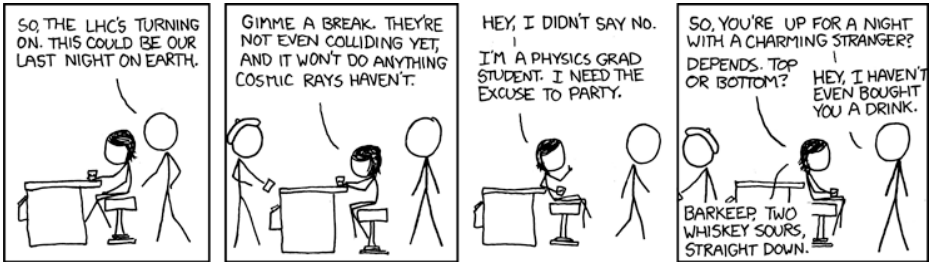
Randall further anticipates that many of his readers will respond with strong opinions of their own about the argument, and pre-emptively shuts it down, saying "you're all wrong on the internet", which is likely a reference to 386: Duty Calls.

This argument does, in fact, have a clear scientific answer, which Randall proceeded to explain. The airplane can indeed take off, because its forward motion is provided by its propeller/jet engine, not its wheels, which are free to spin at any speed. This is borne out by

both theory and experimentation (having famously been done by the Mythbusters).

#474: Turn-On

September 10, 2008



Supercollider? I 'ardly know 'er!

Explanation

This comic refers to the first startup (turn on) of CERN's Large Hadron Collider (LHC). There was a theoretical concern that the LHC experiments could create a black hole that would suck in our planet.

Cueball uses this concern when telling Megan that this could be their last night on Earth, but since the scene is in a bar, this is just another lame entry he uses because he just wants to spend the night with her.

Megan answers as a physicist and explains that, first of all, they will not start colliding particles just because they actually turn on the collider. That will take a while, during which everything needs to be checked. Secondly, scientists have determined that the fears are unfounded — among other things because cosmic rays have already been bombarding the Earth with particles even more energetic than those created by the LHC. Thus, if the LHC could create a black hole that would suck up the Earth, then that would have happened long ago due to the cosmic rays. (At present time, the collider has been colliding particles for years, and if you read this line on or near Earth, then the Earth is still here; if you read it in a galaxy far away from the Milky Way, then it is somewhat more plausible that Earth may have been destroyed in the time that the signal took to reach you — although not necessarily by the LHC.)

Cueball feels rejected by her answer and turns away to

leave her, but she calls him back explaining very directly that she did not say "no" to his request (to try to stay a night with her). Also, as she is a physics grad student, she needs an excuse to party — the excuse being that the LHC is turned on.

Cueball feels encouraged and continues his attempt to get her in to bed. But in his next sentence, he unwittingly uses three of the six quark flavors (up quark, charm quark, and strange quark). Megan continues to be very direct when asking if she has to be on top or bottom (when they are going to have sex). But this is also a sentence she chooses so she can continue using quark flavors (top quark and bottom quark). Cueball is flustered and complains that she is assuming too much, since he hasn't even bought her a drink yet. Megan then makes it even worse when she makes an order of two whiskey sours straight down — to use the final flavor (down quark).

Maybe she just teases Cueball (with her knowledge about the LHC and quarks), or else she is actually so turned on by the LHC Turn-On that she wishes to have sex with Cueball as soon as possible.

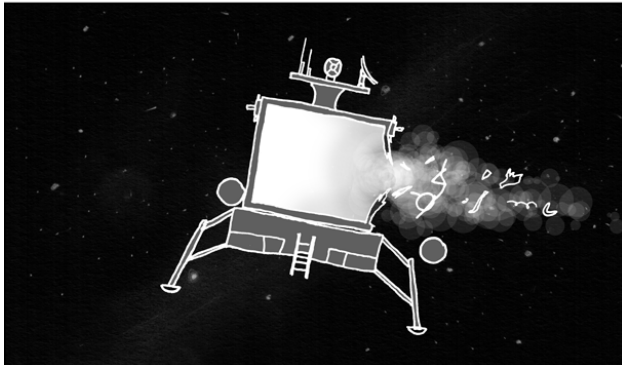
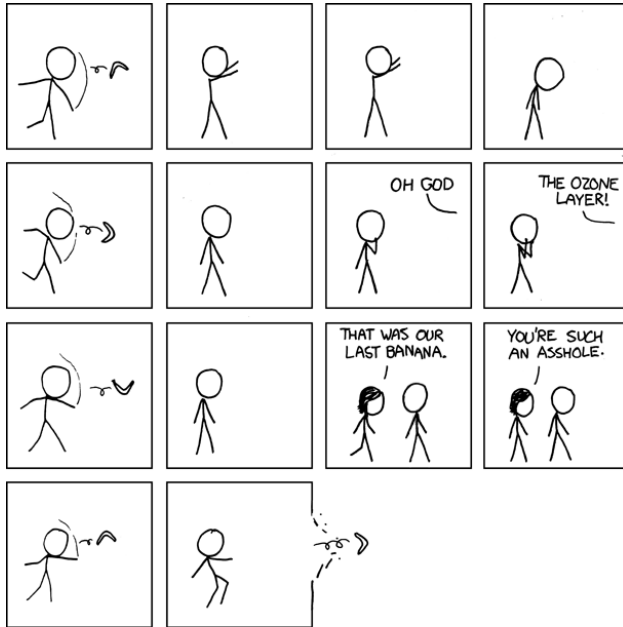
The quarks are some fundamental particles the LHC is generating. All six flavors of quarks are in the last panel: up, down, top, bottom, charm, and strange. They are also referenced in 1418: Horse, 1621: Fixion, and in 1731: Wrong, the latter also mentioning the up and down flavor. The mention of the drinks being served "straight down" is a reversal of the common bartending

term "straight up," but there is no "straight down" in bartending.

The title text is of course a very old joke "I 'ardly know 'er!," which was referenced in 259: Clichéd Exchanges. In this case, Supercollider (another name for the LHC) should be misunderstood as "(Did you) Supercollide her?", which you could put into a (nasty?) sexual context. Using this sentence at the wrong moment could be bad for a nice romance. This could be a reference to the Futurama episode "That's Lobstertainment!," in which Humorbot 5.0 tells a similar supercollider joke.

#475: Further Boomerang Difficulties

September 12, 2008



An eternity later, the universe having turned out to have positive curvature and lots of mass, the boomerang hits him in the back of the head.

Explanation

This comic is a sequel of sorts to 445: I Am Not Good with Boomerangs, as it deals with the same subject matter with the same panel layout.

The first strip shows Cueball throwing a boomerang, which doesn't come back. He looks downwards in the rightmost panel as if in shame. In 939: Arrow, a boomerang returns to Cueball, which can either be the same Cueball from this comic or another person.

In the second strip, he throws another boomerang, which somehow manages to hurt the ozone layer (as indicated by an off-screen voice). This is of course not possible with a boomerang, as the ozone layer is a layer of O₃ molecules very high up in the atmosphere.[citation needed]

The third strip shows Cueball throwing something that appears to be a boomerang, but then Megan enters and reveals that it was their last banana - which she probably had expected to eat since she calls him an asshole. Perhaps this is why she broke up with him in the first comic.

The final strip shows Cueball throwing one last boomerang, which breaks the frame of the comic, already after two out of the four frames used in each of the first three strips. In the second panel, Cueball seems to be leaning backward in shock or terror. Then, panning

down, we find the last panel, much larger and suddenly mainly black instead of white. It shows that this time he was actually inside a spacecraft (which resembles an Apollo Lunar Module in a very bad manner), and the boomerang has just broken out through the hull. We see the boomerang and Cueball tumbling out into space with the escaping air to certain death, revealing why Cueball was so taken aback when the boomerang broke through the frame.

If you try to link up the rightmost panels, as what was suggested 445: I Am Not Good with Boomerangs to get a bonus comic strip, you get a bad story where Cueball is looking down, presumably in shame. Then a person (presumably Megan), screams about the ozone layer. We also see Megan call Cueball an asshole, probably because he had destroyed (or messed with) the ozone layer.

The title text notes that, assuming a theory that is no longer generally accepted where the universe has a positive (closed) curvature and lots of mass, the boomerang would, after a (very) long time, hit Cueball in the back of his head. This would happen because under those conditions the entire universe would eventually fall back on itself in the Big Crunch. Before this happens, everything would again get pressed close together, and it is during this process that the boomerang would finally return to his frozen (but quite possibly preserved) head. (So at least one "success" in four attempts.)

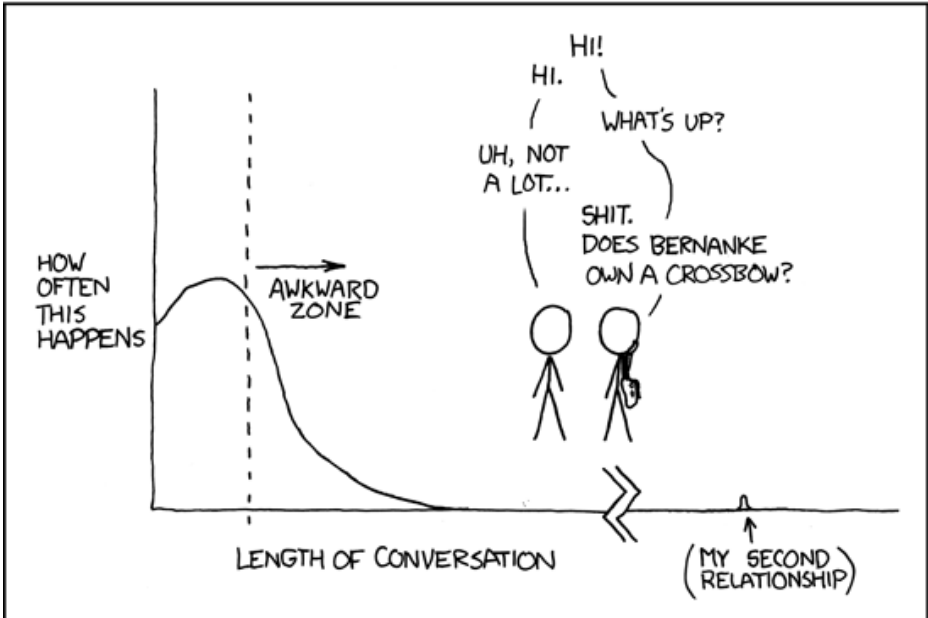
Boomerangs also became a main theme in the interactive comic 1350: Lorenz. The same format of multiple bad

endings to the same starting set-up is used in 1515:
Basketball Earth.

#476: One-Sided

September 15, 2008

SOMETIMES MY CONVERSATIONS WITH STRANGERS GO ON FOR A WHILE BEFORE I REALIZE THEY'RE TALKING ON THEIR PHONES.



He continued, 'Okay, Bernanke is uncontaminated. Find a crossbow and get him into position behind one of the columns at the Fed entrance. This is gonna get ugly.'

Explanation

The comic refers to the phenomenon of hearing half a conversation from a stranger on a cell phone and, not noticing the cell phone, imagining that that person is talking to you and responding in kind. The chart gives a plot of the frequency that this occurs (for Randall here represented by the Cueball to the left) against the amount of time that passes before the error is discovered. It also implies that Randall's second relationship was in reality just a particularly long instance of this occurrence, suggesting that his 'partner' wasn't even aware of the relationship.

The title text is the continuation of the phone call, which involves a fictional conspiracy involving the then Chairman of the Federal Reserve Ben Bernanke and a crossbow.

On September 23, about a week after this comic, Randall posted a short story to his blog, featuring Ben Bernanke breaking into the Federal Reserve building with a crossbow.

#477: Typewriter

September 17, 2008



I DIDN'T REALIZE HOW BAD MY HABIT OF TABBING TO FIREFOX EVERY FEW SECONDS TO CHECK NEWS SITES HAD GOTTEN UNTIL I TRIED WRITING ON A TYPEWRITER.

Somewhere in the world, my actual grandmothers are reading this and angrily exclaiming that I never write even malformed thank-you notes. DEAR GRANDMOMS: I AM SORRY! YOU ARE WONDERFUL PEOPLE AND THANK YOU FOR EVERYTHING. LOVE reddit.com RANDALL.

Explanation

Randall is writing a letter to his grandmother on a typewriter, thanking her for taking him and at least one other person on a trip. However, due to a habit he's developed from using a computer for so long, Randall inadvertently litters the letter with chunks of blank space followed by website URLs. As if through muscle memory, Randall periodically attempts to check the latest news by pressing a combination involving the Tab key, typing the URL of a specific website, then pressing a combination using the Tab key again.

On a computer, the Ctrl+Tab keyboard combination usually switches to between browser tabs within a window, such as between two Firefox tabs, while Alt+Tab switches between windows. However, there is only a simple Tab key on an old-fashioned typewriter. Pressing Tab there doesn't switch to another screen, it just moves the platen (the typewriter's cursor, so to speak) to the next tab stop, leaving a wide space before the next typing on the same piece of paper. So the key combination that would satisfy Randall's somewhat hyperactive impulses on a computer is dramatically different on a typewriter, where that key instead causes movement of the platen. So, he hits the tab key, types a URL, and hits the tab key again right in the middle of his letter. It also shows Randall's love of news and information websites.

The title text references that Randall's real grandmothers,

upon seeing this comic, might feel bad that he doesn't write to them at all — not even poorly-written letters like in the comic. To remedy this, he writes a brief thank you note to his grandmothers... which also includes one Ctrl/Alt+Tab combination.

#478: The Staple Madness

September 19, 2008



Staple guns: because duct tape can't make that 'kaCHUNK' noise.

Explanation

Optimistic Beret Guy can never take life seriously. He loves to play with everything, and nothing is more exciting than a tool that sticks things together with an impressive kaCHUNK sound when he pulls the trigger, even on things that (definitely) shouldn't be stapled.

Installing Debian is a pun on the installation of software, and the installation of real life things by attaching them to things.

This comic may reference an engineering truism describing a similar scenario: "When all you have is a hammer, everything looks like a nail." The truism's actual meaning refers to the scenario where when a novice has only learned to use one tool (such as one programming language), they may attempt to solve all problems using only that tool, which may end badly. This saying is referred to explicitly in 801: Golden Hammer.

From just reading the comic by itself, one may presume that in the last panel, Cueball has been stapled to the ceiling (as obvious evidence to Megan that Beret Guy has indeed been abusing her staple gun). According to the comic's official transcript, however, it is in fact God who is speaking. Due to Beret Guy's strange powers, it is rather likely that God has been stapled as well -- perhaps to the ceiling.

Duct tape, thanks to its combination of tensile and

adhesive strength, is commonly regarded as the ultimate do-it-yourself repair tool. Like a staple gun, it can also be used to stick things together. Although it does make a nice sound when pulling a strip out quickly, it does not make a loud kaCHUNK sound upon fixing two objects together.

In 291: Dignified, Beret Guy hangs upside down and says (in the title text) that he has stapled his hat to his head to make it stay on. That may very well have been the inspiration for this comic.

This was the fourth time the name Megan was used in xkcd, the first time being in 159: Boombox.

#479: Tones

September 22, 2008



I need a lawn, so I can yell at kids to stay off it.

Explanation

This comic begins with Cueball staring introspectively out the window, reflecting on his life's choices. He first comments on his regrets and failures, but reassures himself it was all worth it by standing firm to a single moment he stuck to his convictions for a better purpose. This fairly serious scene is broken up by the punchline that his proud moment is completely mundane and not at all remarkable: Cueball doesn't use novelty ringtones for his cellular phone.

Cell phone users can set nearly anything as their ringtone; even the default rings on new phones are a short string of notes put together, and serve a dual purpose as a company's trademark. Phones today can even set multiple ringtones, one as a default and several custom tones for their frequent contacts. During the early 2000's companies and customers were very quick to flaunt these features and it was subject to countless commercials and parodies (including this comic).

The comic also seems to begin very seriously, with Cueball standing at a window looking at the setting sun which also indicates that he's in a late phase or near the end of his life while pondering about his past life and thus the comic relief is provided by the turn to the inconsequential; this is mirrored in the zooming-in to the cell phone on the table.

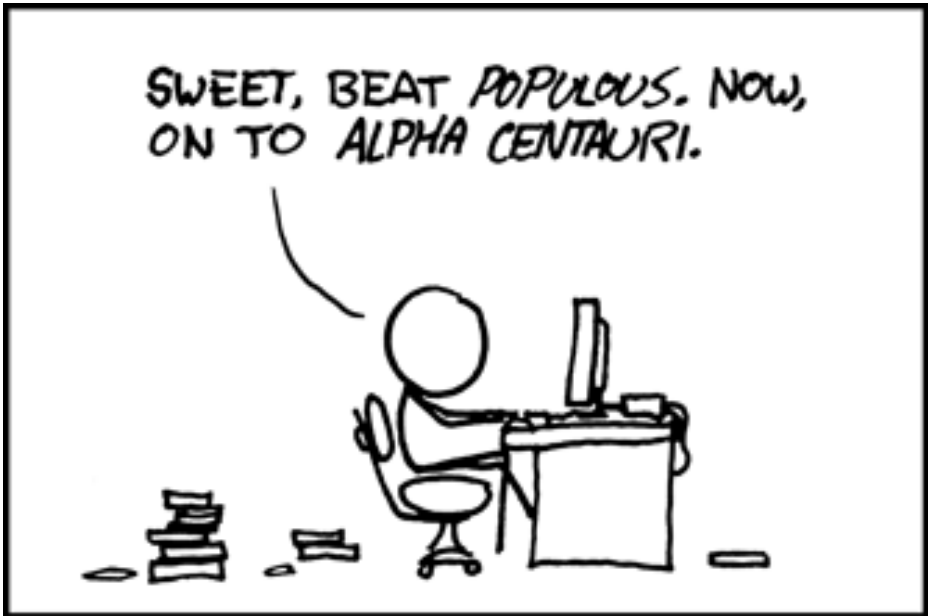
To continue the comic's theme of

Cueball-as-crochety-old-man, the title text says that he needs a lawn, so he can yell at kids to stay off of it — a stereotypical "old man" behavior.

Randall makes another complaint about ringtones in 2272: Ringtone Timeline.

#480: Spore

September 24, 2008



UNTIL I CAN AFFORD SPORE,
I'M JUST PLAYING THROUGH ALL
MY OLD GAMES IN ORDER OF SCALE.

Way to not support the GMA 950 under OS X, Spore. :(

Explanation

Spore is a game that was released in 2008. Spore starts you off as a cell, and when you become smart enough, you leave the water for land and start growing. To begin with, the scale of your interest is thus very small as you are only concerned with your spot of water. During the next two stages, the scale grows to being the entire continent. Once you start building cities, you get to view the entire planet. The last stage (and scale) is space, where you get to first travel through your own solar system, then the entire galaxy.

Cueball runs into a common gamer's problem, that being an inability (or unwillingness) to purchase a game on its release date due to the initial price. Since Cueball can't yet afford Spore, he instead is recreating the experience by playing older games, starting off with small scale games. In the comic, Cueball had just beaten the game Populous, which is on a planet scale, so now he can go on to the interstellar scale with the game Alpha Centauri.

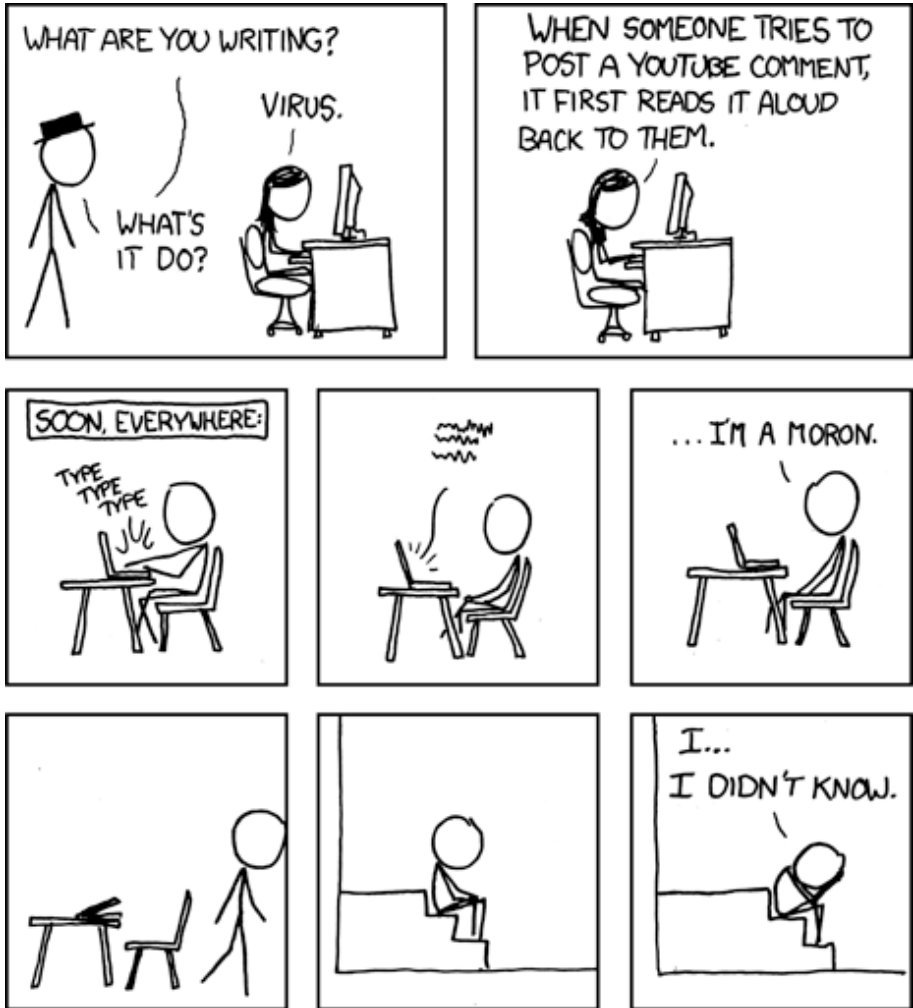
The following three games could, for instance, have been played before the ones mentioned: SimAnt (ant scale), then moving up to The Sims (human scale), and then proceeding with SimCity (city scale).

The title text refers to the game not being able to run on the Mac using a GMA 950, which is a type of Intel integrated graphics processor. It was first supported in

OSX 10.4. It lacked hardware support for vertex shader 2.0, which some games required.

#481: Listen to Yourself

September 26, 2008



Man, I just wanted to know how babby was formed.

Explanation

YouTube is a website for video sharing where anyone can upload and view videos. It is notorious for having some of the most ridiculous, hateful, mean-spirited, nonsensical comments of any mainstream website (a reputation touched upon earlier in 202: YouTube).

Danish tells Black Hat that her computer virus that she is writing reads a YouTube user's comments back to them before it is submitted. Upon hearing their own ridiculous comments read aloud to them, they will realize the stupidity of it and not submit the comment. YouTube later made this a real feature, although it has since been removed again.

The title text is in reference to a post left on the Yahoo! Answers website in 2006 by a submitter known as "kavya," who asks "how is babby formed / how girl get pragnent." The post picked up internet popularity and spawned several flash animations. This was again mentioned in 522: Google Trends and in 550: Density.

September 29, 2008



Interestingly, on a true vertical log plot, I think the Eiffel Tower's sides really would be straight lines.

Explanation

Height uses a logarithmic scale to depict the contents of the universe at progressively smaller distances from Earth (less high above the Earth), starting at the highest possible "point," the edge of the observable universe, going all the way down to the grass beneath our feet. The comic is a direct companion piece to 485: Depth, also released on a Monday the week after this one. Depth similarly uses the logarithmic scale to depict the Earth at progressively greater magnification (going "deeper" down), from Earth's surface (the grass) to the interior of a single proton.

The very top (edge) of the observable universe is described as being 46 billion light years above the Earth. The universe is "only" about 13.8 billion years old, so the cosmic background radiation that reaches the Earth today has also only traveled 13.8 billion light years. However, during that time, the universe has expanded, so the galaxies that formed from that spot where this background radiation was emitted 13.8 billion years ago would now be 46 billion light years away. This has led to many misconceptions regarding the size, the most typical being that the radius of the observable universe is "only" 13.8 billion light years. See this video, [How Do You Measure the Size of the Universe?](#), for a great explanation of the 46 billion light years.

To the right of the text, Black Hat stands atop the comic, having just dropped a cat off the edge head first; he is

clearly going to test if the cat will land on its feet, being a jerk per his usual character. It will take some time, though, before the cat reaches Earth....

As one scrolls down, the depicted distances become less compressed, until arriving at the surface of Earth, all the while approaching a 1:1 scale with real-life distances. As shown in 1162: Log Scale, if Randall didn't do this, the comic would be much, MUCH longer.

In this comic, most objects that are grounded on Earth are scaled logarithmically on the vertical axes and linearly on the horizontal axes (some are scaled linearly on both axes). Displaying objects in this manner noticeably distorts their shape; the Great Pyramid, for instance, looks not like a pyramid but like a bullet.

Outside of the Earth's atmosphere, the objects are placed at their actual distances from Earth on the log scale, but their shapes are not subjected to the logarithmic scaling of Earth objects, instead appearing as they would be seen (otherwise, round objects like the sun would appear more egg shaped, with the flatter side facing upward). However, objects are still much larger or much smaller than they would be in real life, in order to allow them to be properly seen.

In the title text, Randall muses on how the inwardly-curved sides of the Eiffel Tower might actually become perfectly straightened when subjected to this logarithmic distortion. Although it is shown to bulge in the comic proper, this may be a consequence of Randall's

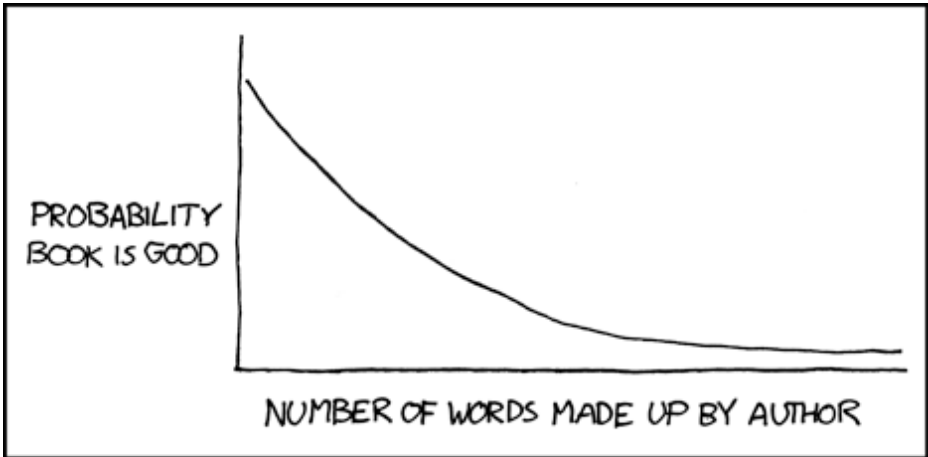
rough art style rather than any reflection of his beliefs. The actual shape of the Tower approximates an exponential curve, which would indeed give a straight line on a log scale, although it was actually designed by Gustave Eiffel to minimize wind resistance rather than to be mathematically exact (the design is so perfect that the amount the Tower sways in the wind is less than the amount it is distorted due to thermal expansion of the sunlit side).

Objects[edit]

All objects are sorted from bottom to top by their maximum distance from earth for objects in a solar orbit, and their current distance for others.

#483: Fiction Rule of Thumb

October 01, 2008



"THE ELDERS, OR FRAÁ'S, GUARDED THE FARMLINGS (CHILDREN) WITH THEIR KRYTOSES, WHICH ARE LIKE SWORDS BUT AWESOMER..."

Except for anything by Lewis Carroll or Tolkien, you get five made-up words per story. I'm looking at you, Anathem.

Explanation

Randall uses a graph that purports that the more words an author makes up, the less likely their book is any good. To demonstrate this, he provides an example where a hypothetical author uses three made-up words in a single sentence: "Fra'as", "Farmlings", and "Krytoses". The author clearly does not see that having to insert explanations of all the made-up words makes the sentence extremely clumsy.

The title text declares that the average author is allowed five invented words per book before this rule is invoked against them, but mentions that J.R.R. Tolkien and Lewis Carroll are exceptions, as they are both very famous, well-respected writers who made words up all the time.

Randall also makes a dig at *Anathem*, a speculative fiction novel by Neal Stephenson about a monastic order on another planet that studies science, mathematics, and philosophy. The book is noteworthy for having a very large number of made-up or repurposed words, enough to require its own glossary. One of the more common other-worldly words is fraa (without an apostrophe), as an analogue to "friar"/"brother".

#484: Flash Games

October 03, 2008



THE MOST POWERFUL GAMING SYSTEMS IN THE WORLD STILL CAN'T MATCH THE ADDICTIVENESS OF TINY IN-BROWSER FLASH GAMES.

Although ... who else can't wait for them to incorporate that Wiimote head-tracking stuff into games? Man, the future's gonna be **awesome**.

Explanation

Dedicated hardcore gamers will often indulge in expensive, top-of-the-line equipment to get the most out of their video games.

Adobe Flash was a software platform allowing multimedia applications in the browser. Flash became a popular choice for game developers, since playing Flash games only requires a browser and the free cross-platform Flash runtime environment. Randall was right that Flash games are quite addictive, and gamers would have found them more engaging than anything that runs on expensive (dedicated) gaming systems.

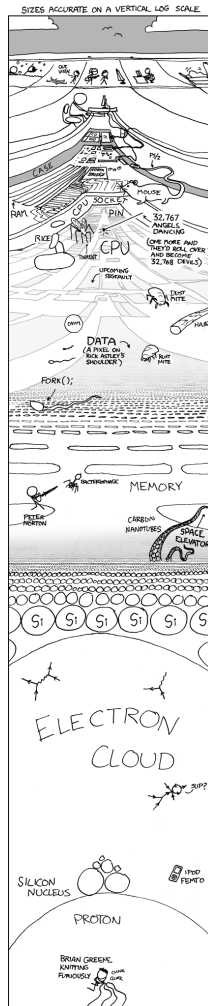
Nowadays, years after the making of this comic, Flash has been completely phased out by modern browsers in favor of HTML5 + JavaScript. The open-source movement especially prefers the latter, since no proprietary browser plugins are needed to run it. That said, the sheer number of Flash games that have been made over the last decade means that Flash will likely hold a special place in many gamers' hearts for the foreseeable future, to the point where "Flash game" has become a catch-all term for any browser game.

The comic may also be commenting that some modern games are too focused on graphics and not enough on gameplay.

The title text mentions the Wiimote, the standard

controller for the Nintendo Wii video game console. Wii games are usually controlled by tracking the movement and orientation of the handheld Wiimote, but Johnny Lee devised a method to use a Wiimote to track the position of the users head and demonstrated this with a desktop VR display. It should be noted that this is not the same as the body tracking that is available from Sony and Microsoft with the EyeToy and Kinect respectively, neither of which has earned any real praise as a practical gaming controller.

October 06, 2008



The Planck length is another thousand or two pixels below the comic.

Explanation

The comic is a companion piece to 482: Height, which explored a logarithmic scale from the edge of the observable universe down to the Earth's surface. Depth continues the process, viewing logarithmically smaller scales from Earth's atmosphere down to the interior of a single proton. This combination is reminiscent of Charles and Ray Eames' 1977 short film Powers of Ten.

Here's a walk through the entire comic:

- At the top, we see a cutaway view of a story apartment complex. From left to right, different activities can be seen in the apartments; Megan and Cueball playing in a ball pit, Megan exorcising Windows Vista, Ponytail and Megan playing Guitar Hero or a similar game, Cueball at a desk, and what appear to be some sexytimes.
- The view descends into Cueball's tower PC.
- Entering the computer's internals, we see a mouse plugged into the PS/2 (6-pin mini-DIN) connector. This is a visual pun, since the mouse is an actual rodent and not a handheld device.
- Next, we dive into the CPU. We see a multi-layered pun on the question "how many angels can dance on the head of a pin?" There may be a pun with a chip's connector pin, but the more obvious reference is Randall's answer of $32,767 = 2^{15} - 1$, the largest possible value of a signed 16-bit integer. Adding one rolls back over to $-32,768$, which is 32,768 devils or

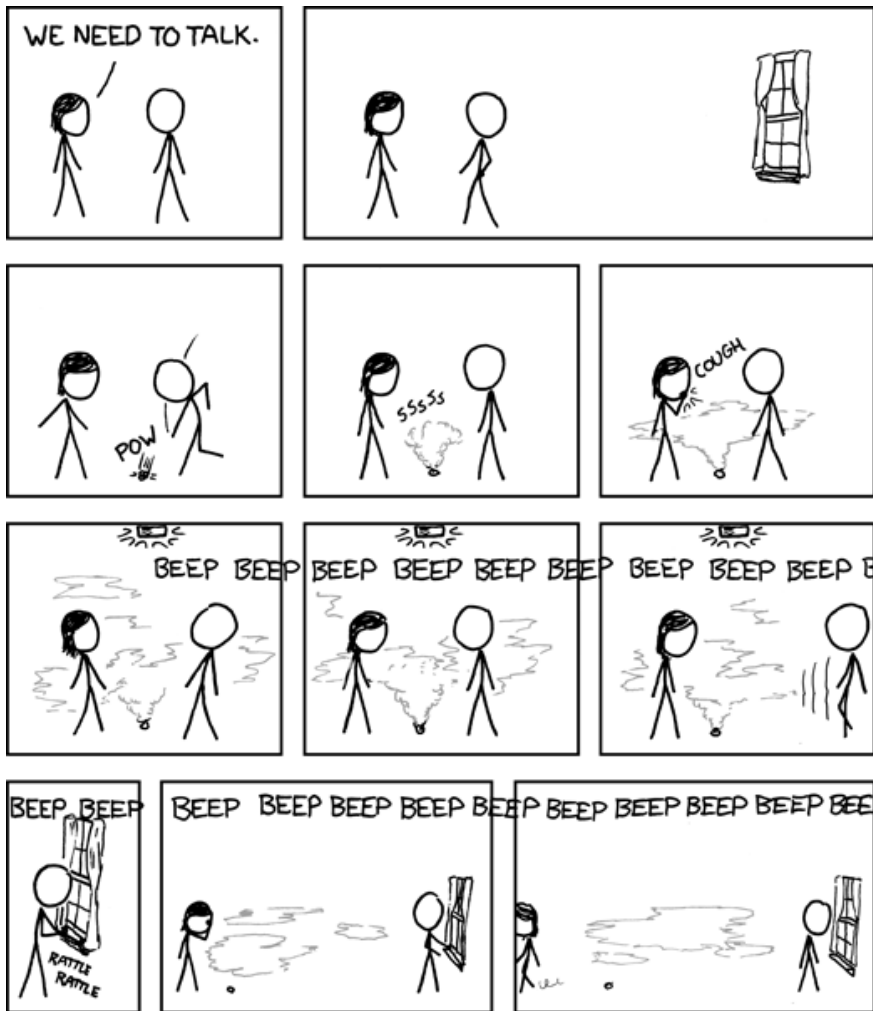
"negative angels." (See 571: Can't Sleep for a similar joke and a more elaborate explanation.)

- A blood-sucking mosquito appears to be "leeching" a torrent.
- A segfault is a problem with memory access.
- Dust mites are small arachnids that feed on house dust and are known to cause allergies. Rust mites are very small mites that live on plants and cause discoloration of leaves and fruit, or small galls.
- We zoom in on a memory unit on the CPU. Cueball is being rickrolled, as indicated by the label "pixel on Rick Astley's shoulder."
- A "fork();" command points at one of several unlabeled spermatzoa. Forking and sperm are capable of spawning "child processes."
- Peter Norton is the founder of Norton Antivirus. He is shown fighting a biological virus, rather than informatic malware.
- Showing the relative scale of carbon nanotubes, the suggestion is that these then lead on to a more megastructural Space Elevator, for which carbon nanotubes are often cited as a suitably strong component needed for the cable.
- We soon zoom in on a silicon atom in the CPU. In the electron cloud, the squiggles made out of arrows are Feynman diagrams. A Feynman diagram in the shape of a stick figure is saying "Sup?", a pun on the "Sup" particle (supersymmetric partner 'squark' to the Up quark) and an abbreviation of the greeting "What's up?"

- An 'iPod Femto' is shown, as a pun on the 'iPod Nano' (both are SI prefixes), both of which refer to units far smaller than any iPod that has ever, or likely will ever, be created.
- Brian Greene is a theoretical physicist and pop scientist who discusses the nature of the universe. The picture of him knitting is a pun on string theory and PBS miniseries *The Fabric of the Cosmos*. The term 'knitting furiously' shows up in the 1857 Volume 14, page 46 (available via HathiTrust and Gale (preview)) of *The Monthly Packet*. Furthermore, Greene doing something furiously references "Colorless green ideas sleep furiously", a correctly-formulated sentence that nonetheless conveys no meaning or logic.
- The Planck length (ℓ_P) is the smallest theoretically measurable distance, defined by three fundamental constants in physics: the speed of light in a vacuum (c), Planck's constant (h), and the gravitational constant (G). The Planck length is vastly smaller than any known particle that isn't a point mass, and modern physics is a long way from investigating such a scale. The comic is 2,050 pixels tall, and Randall mentions the Planck length is roughly a further two thousand pixels past Brian Greene.

#486: I am Not a Ninja

October 08, 2008



'The sad thing is that I just wanted to talk about your poor smoke-bomb techniques.'

Explanation

In a romantic relationship, some of the most horrifying words are arguably "We need to talk." They often stereotypically signal the beginning of a conversation that the speaker knows will cause the listener to become upset.

In this comic, Cueball is so horrified by hearing those words that he tries the ol' "ninja smoke vanish" technique, only to have it fail miserably when the pellet provides insufficient visual cover to perform the trick, yet still sets off the smoke detector, and then he can't get the window open to either leave the scene or just clear the less than useful cloud. Megan simply facepalms and leaves.

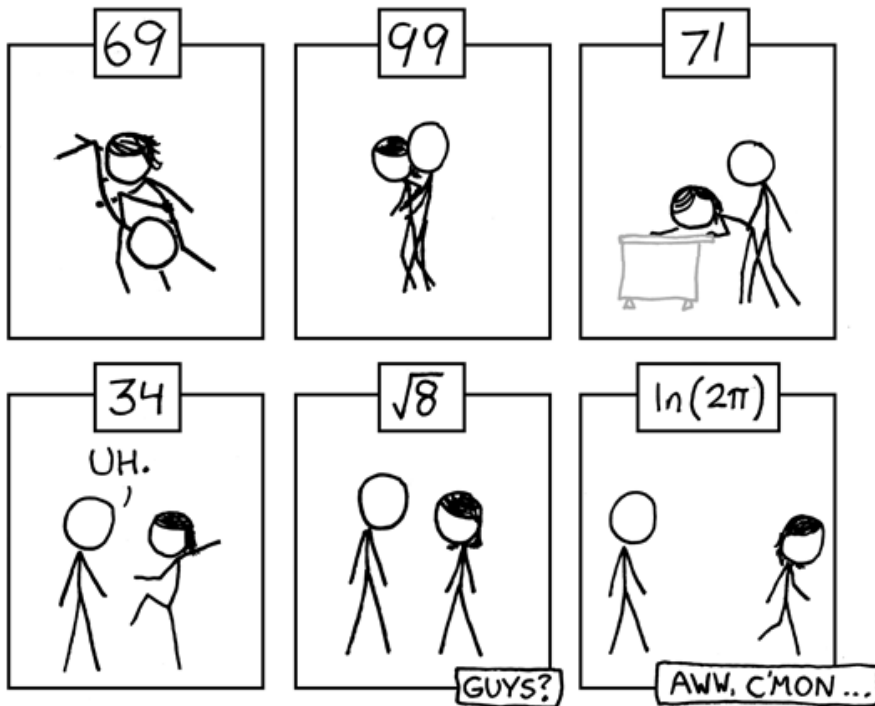
The title text jokes that Megan simply wanted to talk to Cueball about his poor smoke-bomb techniques. Arguably, then, this instance was actually a qualified success in issue avoidance.

He continued to keep smoke bombs on his person for situations such as these as seen in the title text of 1712: Politifact.

#487: Numerical Sex Positions

October 10, 2008

XKCD PRESENTS A GUIDE TO NUMERICAL SEX POSITIONS



We didn't even get to the continued fractions!

Explanation

Sex positions are positions that two people can have sexual intercourse in. Many of them are named, although only one generally accepted position is named after a number: the 69.

Cueball and Megan try to approximate the shapes of the numbers, which they are given by the narrator, as sex positions. They start with the classic 69, then represent the number 99 as "spooning" while standing and the number 71 as "doggy-style" sex over a table. They are then given ever more difficult numbers to attempt, first 34 (maybe referencing rule 34 of the internet) - Cueball exclaims Uh as he has no idea how to make a 3 (maybe he's supposed to curl up in a fetal position), although Megan does try (in vain) to form a 4. Then they are completely baffled by $\sqrt{8}$ (AKA $2\sqrt{2}$ or ≈ 2.82842712475) (presumably one of them is to contort into a figure-eight shape while the other lies on top), and just stand there while the narrator asks Guys? - as in give it a try. And finally, Megan gives up and leaves at the suggestion $\ln(2\pi)$ (or ≈ 1.83787706641) to the frustration of the narrator, who exclaims Aww, c'mon.

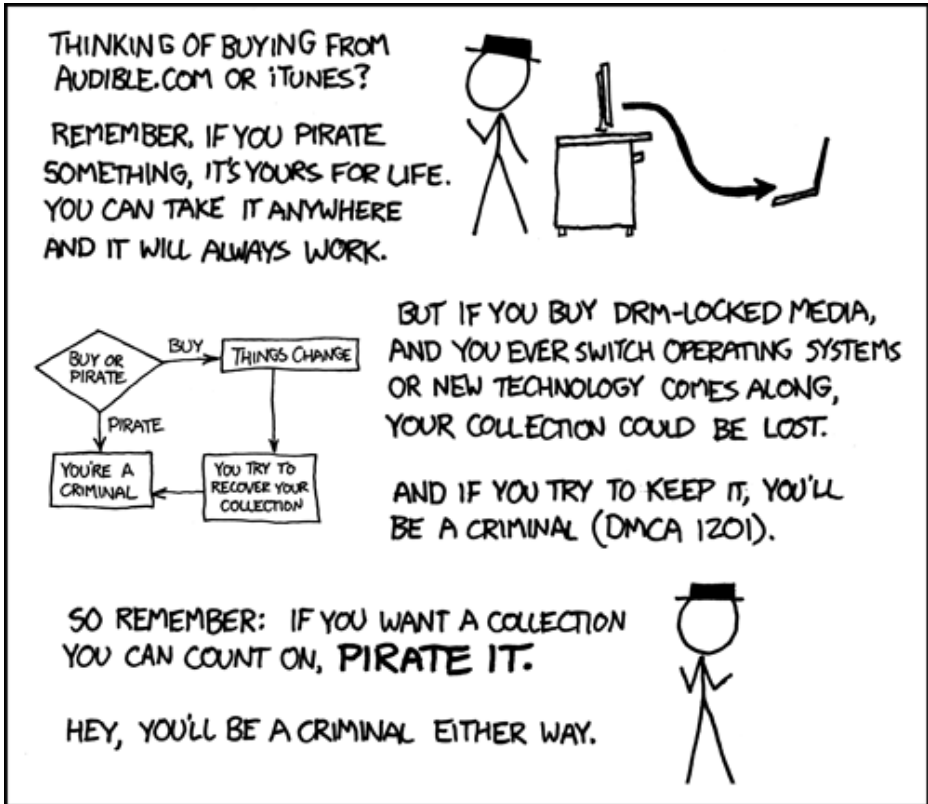
The narrator is so frustrated, as we are told in the title text, because he did not even get to ask them to do a continued fraction (which likely would have involved many other people) as the ultimate challenge.

An additional line in xkcd: volume 0 suggests posing to

form the definition of the gamma function.

#488: Steal This Comic

October 13, 2008



(IF YOU DON'T LIKE THIS, DEMAND DRM-FREE FILES)

I spent more time trying to get an audible.com audio book playing than it took to listen to the book. I have lost every other piece of DRM-locked music I have paid for.

Explanation

DRM, an acronym standing for Digital Rights Management, is a recent anti-piracy mechanism that is used to prevent unapproved or unintended use of software programs. Examples would be a requirement to play a video game while online (where the servers can validate that the game has not been hacked) or allowing only a limited amount of installations to ensure that different users are buying the program for themselves instead of sharing it. The problem is that there are ways that DRM can be restrictive even upon legal situations. Someone may simply want to play the game in an area where there is no Internet connection, or they may have exceeded the amount of allowed installs due to installation problems or hardware malfunctions requiring the purchase of new hardware. In the audio situation described in the comic, one could not, say, transfer an audiobook or song from an iPod to a Blackberry phone, because Apple does not allow files on its operating system to be used on ones from other companies. For this reason, DRM has also been referred to derisively as "Digital Restrictions Management".

Black Hat uses a flow chart to propose two paths:

- If you pirate the audio, the DRM would necessarily be disabled or removed in order to be available in that fashion. This is in violation of copyright law and is also considered theft in some countries such as the United States, since it avoids payment to the publishers,

performers, composers, etc. who created the audio.

- If you buy the DRM-locked audio, you have legally obtained it for use on your device. However, as Black Hat puts it, "things change": the device you have the audio stored on could be lost, stolen, or broken. The device will inevitably get old enough that the company that made it will stop supporting updates for it, and newer software may no longer be compatible with it. In the worst case scenario, the device may be sabotaged by the company. If the DRM prevents the audio from being recovered or transferred from the device or allows the service providing you with the audio to delete it, you would have to pay for it a second time to re-obtain it legally, which no one wants to do. The only other solution is breaking the DRM to try to recover your collection by force, and Black Hat argues that this is inevitable.

Since both situations have you end up being a criminal, Black Hat proposes taking the pirate path, which leaves you with a collection of dependable audio for free. In the title-text, Randall gives an anecdote of how ridiculous it was to obtain an audiobook legally, and how all of his other legally-obtained music has been lost, as the flow chart predicts.

In light of this, he proposes another option: demanding DRM-free files.

It's worth noting that there are other methods of listening to music legally that avoid the problems presented in the comic:

- You can purchase a hardcopy of the audio (e.g. a CD). These are then easily ripped to your hard drive and then copied to other devices, plus a physical item can be useful for older sound systems that do not support digital media. However, there are some downsides: higher cost, delayed delivery, necessity of physical storage space, wearing down of the physical device, and in many cases the non-availability of the desired audio in the first place.
- You can decide instead to think of audio as an experience rather than a thing that you own (similar to going to a movie theater). This type of thinking has given rise to music subscription sites, such as Spotify, where instead of owning the music, the listener is paying for continued access to a very large range of music. However this makes the user dependent on the availability of content on the chosen platform, which may be subject to changes, hence Randall specifying "a collection you can count on".

The title is a reference to the "Piracy is a Crime" ad campaign, as well as a 1970 pro-anarchy book called *Steal This Book*. There is also some underlying humor: since xkcd is under a Creative Commons license, you cannot "steal" the comic, since Randall specifically allowed the comic to be shared. It could also be a reference to Don't Download This Song, a "Weird Al" Yankovic song that amusingly deals with audio piracy.

A note on the site says that Amazon sells DRM-free music files. Since this comic was written, iTunes has also

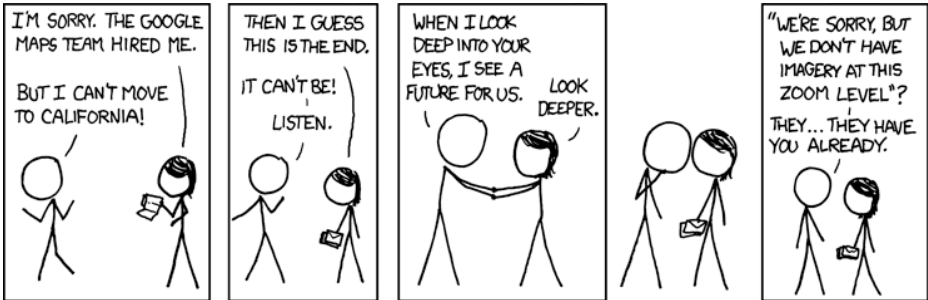
stopped using DRM on music, though it still protects apps, e-books, and videos.

This comic is not applicable to some countries, such as Canada, where copyright infringement is purely a civil matter and is not a criminal offense.

In xkcd: volume 0, Beret Guy says:

#489: Going West

October 15, 2008



Listen, they request that you stop submitting a listing for your house labeled 'WHERE YOU BROKE MY HEART'.

Explanation

Megan has been hired by Google Maps and plans to move to California presumably because this is where Google headquarters is located. Her boyfriend Cueball states that he cannot move there. Megan then just ends their relationship. Cueball does not just give up -- he takes her hand and looks deep into her eyes and claims that he can see a future for them. But Megan asks him to look deeper, and he sees a typical Google Maps message. He realizes that they already own her, and he has no chance of stopping her from going to California.

Google Maps is a service to let people look at the world through their web browser. When Google Maps was first starting out, the maximum zoom level a person could select went past the highest resolution imagery available in certain areas. When this happened, Google Maps would tile the message "We're sorry, but we don't have imagery at this zoom level." When Cueball looks "closely" enough into Megan's eyes, he sees this same message and knows it is over.

The title text refers to a functionality of Google Maps that allows users to submit/update information about places on the map, such as business listings, monuments, etc. Such updates must be approved by Google before other users can see them. Apparently, Cueball has been repeatedly submitting 'WHERE YOU BROKE MY HEART' as a listing for his own house, so that Megan, who is now on the Google Maps team, will see those

submissions. The title text is probably her reply.

#490: Morning Routine

October 17, 2008

MORNING ROUTINE:

1. WAKE UP
2. CATCH UP ON THE LIVES OF FRIENDS AROUND THE WORLD
3. GET OUT FROM UNDER THE COVERS

LAPTOPS ARE WEIRD.

I had a really hard time not writing '... profit!'

Explanation

Thanks to the portability of the modern computer, the availability of the Internet, and the advent of social networking sites such as Facebook and Twitter, someone could conceivably use their laptop to catch up on the lives of everyone they care about from the comfort of their own bed; indeed, they could do it under the covers if they want to.

This is rather different than the pre-computer days in which catching up with friends required a great deal more effort, and even since the introduction of computers and connectivity to various forms of social media, for quite a while the computer monitor could not easily be closer than beside the bed, even if you could drag the keyboard beneath the covers. Hence, laptops are weird.

(In the years since this comic was published, tablets/smartphones have become even more widespread, and laptops are probably now less likely to be found used under the covers if only because they are often not the easiest device to use there any more. Or indeed in just about any other location.)

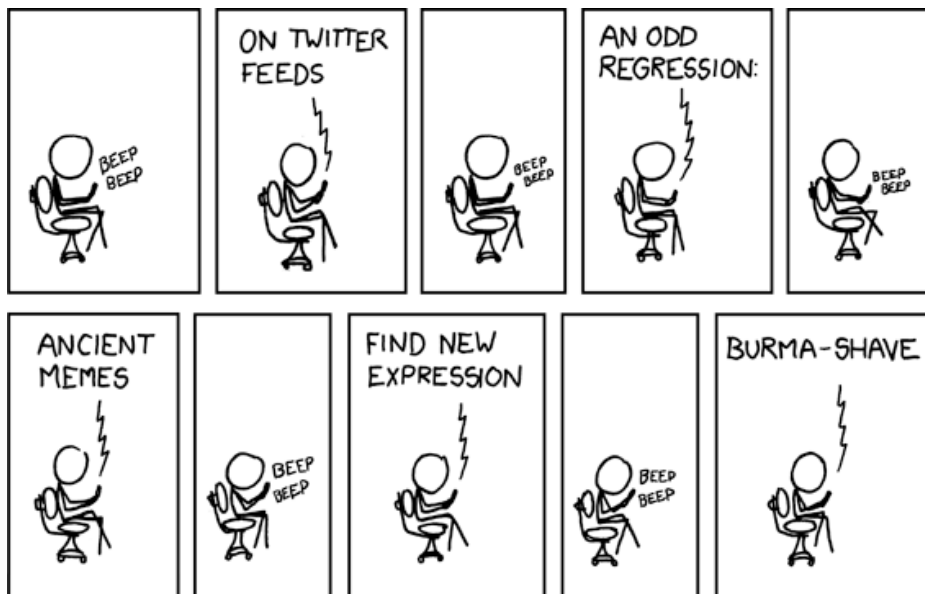
The title text refers to the South Park episode "Gnomes", in which a race of tiny gnomes steal people's underpants. Their business plan is finally explained as:

This became an Internet meme, used in situations where

a person's or group's claimed planned course(s) of action held little clear relevance to their stated or inferred objective of "profit", and so was given a penultimate stage left as an entirely ambiguous unknown. As such, although the list bears superficial similarity to a list ending in "Profit," using this punchline with a clearly revealed second-stage would not be particularly effective or funny, yet Randall suggests that he was strongly tempted to include this, thanks to the memetic resonance.

#491: Twitter

October 20, 2008



If long tooltips / cut off for you / then upgrade from /
Firefox 2 / Burma Shave

Explanation

This comic plays off of an old shaving cream product's Burma-Shave advertising campaign employed on American highways from 1925 to 1963. These ads used short poems, each line arranged sequentially on a sign along a highway, the last line always being "Burma Shave," the name of the shaving cream. Originally, these ads only described the product, but others included driving safety messages.

Twitter is a messaging service where your messages are restricted in length, so to get a longer essay sent, you will need to break it up in smaller fragments — like the Burma-Shave messages, although the whole of the text of this comic is considerably less than 140 characters and would not need to be broken up on Twitter.

Cueball gets five messages from Twitter on his device that give the following message: On Twitter feeds - An odd regression: - Ancient memes - Find new expression - Burma-shave.

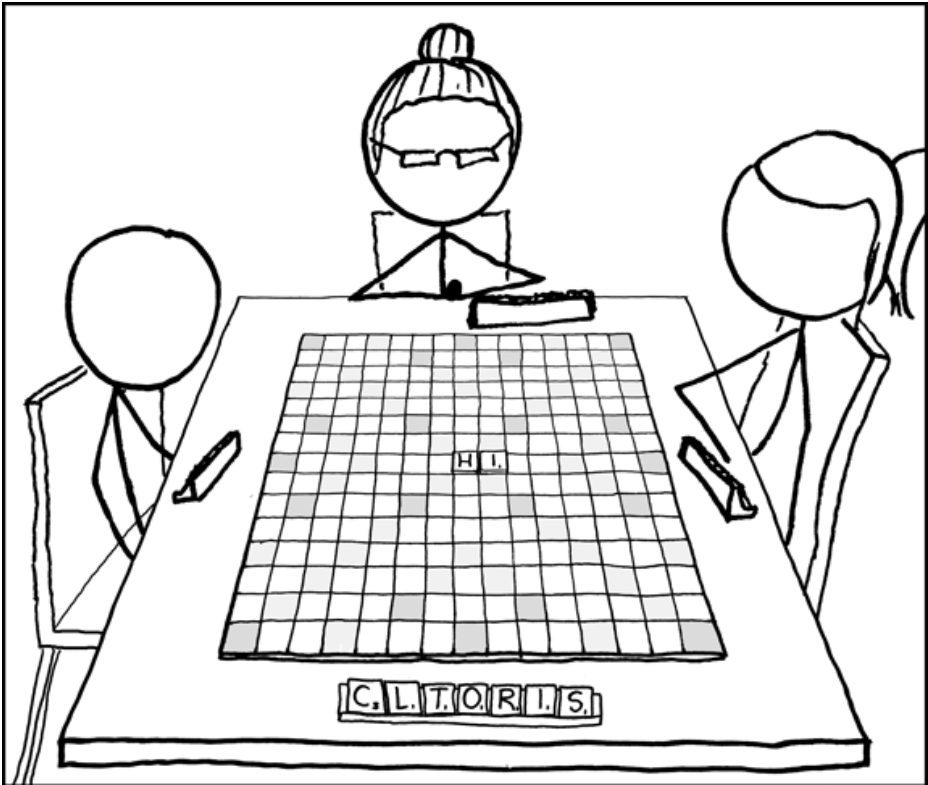
This relates that this old way (ancient-memes) of getting a message through when only having a limited space now again (an odd regression) flourishes on Twitter feeds - Burma-shave...

Firefox 2 had a long standing annoying bug where only the initial part of the title text were shown as a tool-tip, creating a "Burma-Shave" effect of only being able to see

some of the text. Unlike Burma-Shave, where you would see the rest of the text as you were driving down the highway, Firefox didn't actually show you the rest of the text unless you right-clicked show-property, and you would be able to see a sideways scrollable field of the title-text in the properties for the image.

#492: Scrabble

October 22, 2008



THIS ALWAYS HAPPENS TO ME IN FAMILY SCRABBLE GAMES.

A veteran Scrabble player will spot the 'OSTRICH' option.

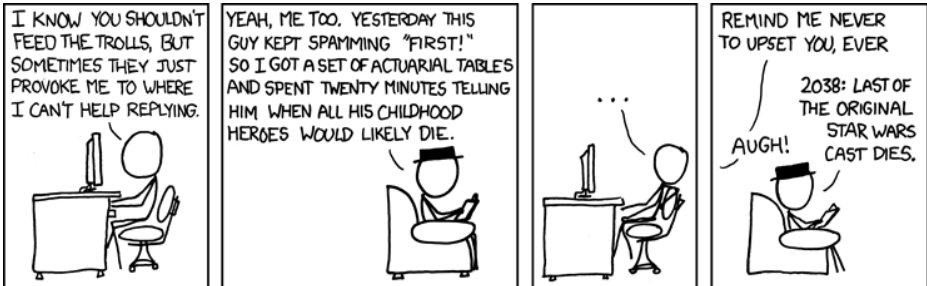
Explanation

This comic depicts a game of Scrabble, a popular board game where the goal is to form words with the letters in your hand. The joke here is that the obvious option here is the word "clitoris," which is an inappropriate word for a family Scrabble game, but gives a 50-point bonus for using all seven tiles. The title text points out that the letters in the hand can also form the word "OSTRICH," which is family friendly, but much lower scoring and not as obvious.

As the H appears to be on the center star square, the narrator will score 63 points if he plays "CLITORIS" (however he uses the two Is, as three of the tiles will fall on double letter scores), and 13 points if he plays "OSTRICH." The highest-scoring play is to hook the C and play "HIC" and "LICTORS," scoring 71 points.

#493: Actuarial

October 24, 2008



I started to do the tables for more famous people but it got really depressing and morbid and I had to go outside. Hat guy wins again.

Explanation

Cueball is commenting about how he shouldn't feed the trolls, but sometimes gets provoked to the point where he can't help replying. The term Trolling is used to describe provocative, destructive, or annoying behavior on the Internet.

Black Hat agrees and tells that he had an issue yesterday with a guy who had a serious case of the

first urge. Some people have to be the first to make a comment on any given posting (be it a blog post or a YouTube video or some other commentable content) and to obnoxiously point out that they have made the first comment. This often manifests as the poster simply posting the word "First" without contributing any actual content to the discussion.

Once again, Black Hat is thus provoked into online retaliation bordering on the sociopathic, choosing a form of retribution that doesn't necessarily break any written rules but strikes directly at the heart and/or mind of his opponent. In this case, he tells the first guy when all his childhood heroes are likely to die - this could make anyone miserable. To do this, he is using actuarial tables or life tables, which show for each age the probability that a certain person will be alive by their next birthday.

Cueball reflects that he doesn't wish to become the target of such ire himself, but (without apparent malice on Black Hat's part...) still suffers from a piece of memetic

shrapnel from the original attack — Cueball obviously loves the original Star Wars movies — and Black Hat would know this!

In the title text, it is said how Black Hat's offensive is so effective that he appears to have caused grief even to his own author and creator, Randall, who only managed to check up on the Star Wars cast before getting too depressed.

So far, seven main cast members have died:

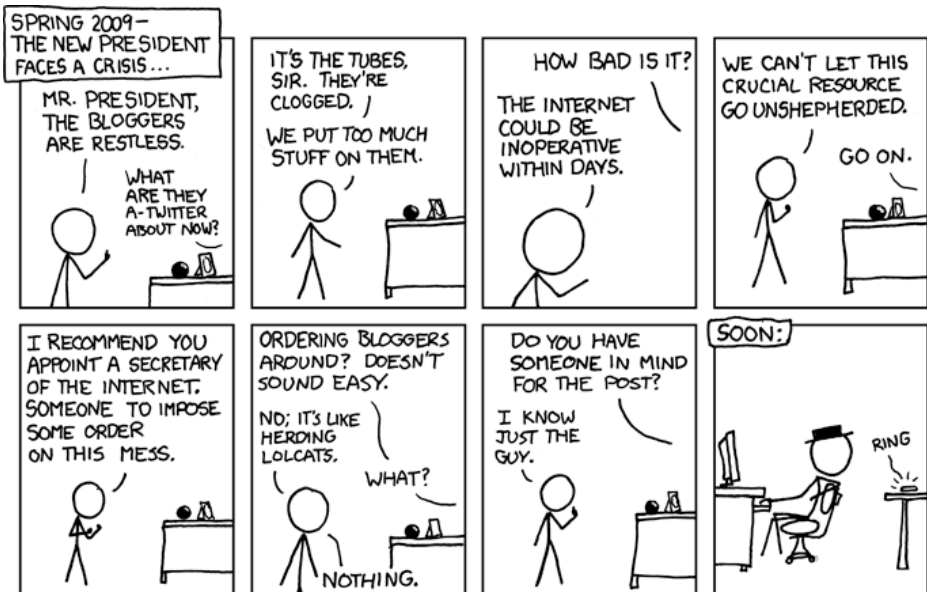
Randall has used this idea again in 893: 65 Years and published a 'morbid' program (the original code has been removed, but an implementation can be found on Github) that uses actuarial tables to calculate the probability that someone will die within a given time. The offense that provoked Black Hat was mentioned already in 269: TCMP and then returned to in both 1019: First Post and 1258: First.

A similar setting with Cueball and Black Hat also discussing movies appears later in 1751: Movie Folder. But then Black Hat is reading on his smartphone.

It is possible that 494: Secretary: Part 1 and the following series are a continuation of this comic, as Black Hat's great power over even Internet trolls via his sociopathic ways would explain why he was chosen as Internet secretary.

#494: Secretary: Part 1

October 27, 2008



The blueprints for the Department of the Internet offices call for Ceiling Cat-themed sprinkler heads.

Explanation

The President of the United States is the chief executive of the United States of America.[citation needed] Since this comic was released in October 2008 and the presidential election was in November, it was then unknown which of the candidates would become president by the time the comic was set (Spring 2009). This is why the president in the comic is out-of-panel and therefore not revealed to us. As it would turn out, the president inaugurated in January 2009 was Barack Obama, who has gone on to demonstrate a tactical use of the Internet (including the more frivolous aspects of it) for public relations purposes. The suppositional president in the comic is less savvy.

This series was released on five consecutive days (Monday to Friday) and not over the usual schedule of three comics a week. It may be a continuation of the comic 493: Actuarial, in which Black Hat demonstrates great power over even Internet trolls via his sociopathic ways. This would explain why Black Hat was nominated as Internet secretary. These are all the comics in Secretary series:

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- 497: Secretary: Part 4
- 498: Secretary: Part 5

The tubes being clogged is a reference to the, now deceased, Alaska Senator Ted Stevens who, during a congressional debate on net neutrality, described the Internet as a series of tubes (be sure to listen to the audio clips in that Wikipedia page, and you'll see why he became a big hit with the Internet). Ted Stevens also gained notoriety for backing a proposal to build a bridge to nowhere using federal funds. The question "What are they a-Twitter about now?" refers to the website Twitter, which is a microblogging and social networking site.

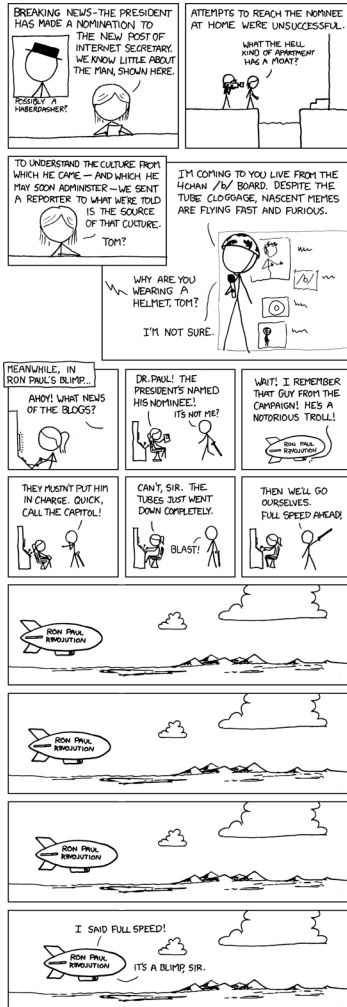
The tubes being clogged may also be reference to numerous sites on the Internet - such as "Tube site" (i.e. Porn 2.0); Youtube; various other sites wiht "tube" in it, mostly video-hostings (e.g. Rutube, PeerTube, SchoolTube, TeacherTube, TroopTube; DTube didn't exist back then). In which case, "we put too much stuff on them" likely means overwhelming amounts of content (e.g. videos, pictures).

Cats are notorious for being hard to herd, thus the idiom "herding cats," meaning an extremely difficult task that can very quickly get away from anyone undertaking it. Lolcats are pictures of cats, usually in humorous poses, that have insipid captions on them. The conflation of lolcats and the herding idiom escaped the president (who is presumably somebody not familiar with the former term). The title text refers to Ceiling Cat, a lolcat parody of God. As with cats, Bloggers are an ideologically diverse bunch, and they are hard to get to go in a single direction. The proposed "Secretary of the Internet" would likely be a new position on the President's Cabinet, which

currently consists of the heads of 15 executive departments and are, with the one exception of the Attorney General (who heads the Department of Justice), titled "Secretary of Department."

#495: Secretary: Part 2

October 28, 2008



That helmet won't save him.

Explanation

Whenever something big happens, the media likes to have at least two things: interviews with people who are the news, and on-the-scene reporters. In this case, Blondie as a news anchor is shown to begin with talking about Black Hat, and she has even been out at his house. Even if those reporters are simply standing in front of a building that something happened in, they have to be on-scene. To thwart the media (and probably everyone else), Black Hat has built a moat around his apartment building. The second reporter is on-the-scene from the Internet, or rather, one of its darkest corners: 4chan. In more detail, 4chan is a collection of image boards that act somewhat like forums, where users go to share images. The different boards are named by their "folder" structure, for lack of a better term. Therefore, the name /b/ comes from its URL: 4chan.org/b/. Pronounced "slash bee" (because the second forward slash is not necessary), /b/ is the "random" board, where anything goes, where anything is the superset of all sets, as in anything. Absolutely. Anything. As in, going more than two seconds without seeing pornographic content or hateful slurs is almost unheard of. /b/ is also the one that gets the most publicity, because it has started many of the memes on the Internet, as well as the birthplace of Anonymous. The chaotic nature of the forums explains why the title text suggests that the reporter isn't safe, even though he is wearing a helmet. In fact, a goofy helmet like that is liable to get the trolls on him faster than if he

didn't have it. This may be a Densha Otoko reference, which features helmet-wearing /b/ members.

A haberdasher is a person who sells small articles of clothing that have been or can be sewed. This could be a reference to former President Harry S. Truman, who operated a failed haberdashery in the early 1920s.

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- 497: Secretary: Part 4
- 498: Secretary: Part 5

Ron Paul is a man who was a U.S. Representative for Texas at the time. At the time the comic was published, he was running, for the second time, for President of the United States. Ron Paul's 2008 presidential campaign did, in fact, use a blimp that was named the Ron Paul Blimp. However, despite their elegant appearance, blimps are not a fast way to travel.

The images on the /b/ board behind the reporter are:

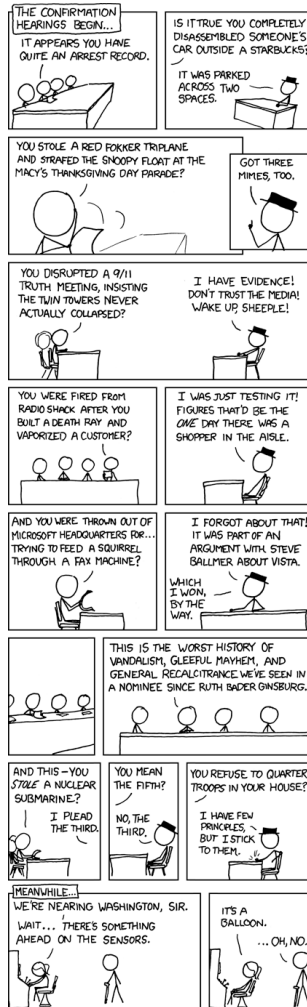
- "Ayyy", a common exclamation by the character Fonzie from the TV show Happy Days, usually while giving two thumbs up.
- /b/, the "random" discussion board on 4chan.
- A Compact Disc (or "CD"), a plastic disc for optical data storage.
- Epic Fail Guy, a meme that originated on 4chan, of a stick-figure character (often wearing a Guy Fawkes mask) who fails at everything he tries.

Together, the initial letters of these items spell out "ABCDEFGF".[citation needed]

The title text states that the second reporter (Tom)'s helmet won't help him, the implication being 4chan is such a dangerous place that body armor is woefully ineffective.

#496: Secretary: Part 3

October 29, 2008



He actually installed each piece in a different car in the lot, then built a new car in the spot from the displaced pieces. It's a confusing maneuver known as the auto-troll shuffle.

Explanation

When a person has been appointed to be on certain positions by the President, they must first go through a confirmation hearing in front of the Senate (the upper house of Congress) where they find if the person is qualified to be in the position they have been appointed to. Of course, Black Hat is not the cleanest of characters, so Congress has a lot of reservations about his résumé. At the time when this comic was released, Senate confirmation hearings occurred rapidly after a president made a nomination and were expected to prevent unsuitable candidates from being given positions of power.

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- 498: Secretary: Part 5

- Starbucks is an American coffee shop chain. He hasn't yet, but in 562: Parking, Black Hat will cut someone's car in half to make it fit in a single space. Not quite as dramatic as completely disassembling a car and, as the title text says, putting a single piece in another car parked in the lot, and building a car out of the displaced parts, which could almost be considered subtle, but it is quite dramatic. The title text refers to the Starbucks incident. Taking all the parts from different cars to build a new car in the same spot parallels the idea in philosophy of the Ship of Theseus, in which a question arises of whether a ship is the same ship if it is replaced piece by piece by identical pieces.
- Charles M. Schulz drew a comic called Peanuts. One of the recurring characters was Snoopy, who would often use his doghouse as an imaginary Sopwith Camel in many battles with The Red Baron, who piloted a Red Fokker Triplane. The Macy's Thanksgiving Day Parade is a parade that happens on Thanksgiving Day in the US. There are many giant balloons of pop-culture icons. Snoopy has made many appearances. Being the classhole that he is, Black Hat has shot up the Snoopy float with a stolen Red Fokker triplane, which would be disturbing, especially to the kids watching the parade, who would get the impression that Snoopy has died. His statement that he "Got three mimes, too" just proves his casual disregard for collateral damage. He may have targeted the three mimes specifically because mimes pretend imaginary things are physically real, and would prove ironic, as Snoopy's adventures in Peanuts are imaginary, so it would make the most sense for the

mimes to be hit.

- 9/11 Truthers believe that the terrorist attack on the World Trade Center towers on September 11, 2001 (thus 9/11) was not actually organized by terrorists, but by the United States government. Black Hat interrupts their conspiracy theory gathering, insisting on a comically exaggerated version of this conspiracy theory in which the attacks did not happen at all and the World Trade Center is presumably still standing. Such a conspiracy is extremely implausible, as it would require either the involvement of every single person to ever set foot in one of the world's largest cities, or some way to conceal a pair of hundred story tall buildings, both of which would be extremely difficult. Whether Black Hat actually believes this, or is just trying to troll conspiracy theorists, is unknown. Black Hat uses a common refrain Wake up, Sheeple to insult the senators.
- RadioShack was a chain of consumer electronics shops that sold parts to build electronics with resistors, transistors, etc. Apparently Black Hat managed to build a death ray from the parts there and accidentally vaporized a customer. His line "Figures that'd be the one day that there'd be a customer in the aisle" refers to the fact that RadioShack stores had been in steady decline over the years,[citation needed] largely propped up by momentum.
- Microsoft is the company that makes Windows, and Steve Ballmer was its CEO until being replaced in 2014 by Satya Nadella. Windows Vista is an operating system

released in 2007; software critics widely panned it. It is unclear how feeding a squirrel through a fax machine could possibly contribute to winning an argument about it, but given Black Hat's almost superhuman abilities to troll and avoid the consequences, it's possible that it could happen. Alternatively, Ballmer could've left the argument after the incident and Black Hat could simply be interpreting that as a victory.

- Ruth Bader Ginsburg was the second female justice on the Supreme Court, appointed by President Clinton. The relevance here is that during her own confirmation hearings, she refused to answer many questions about her personal views, frustrating many Senators (nevertheless, she was confirmed, 96-3). John Roberts, the current Chief Justice, was similarly evasive in his hearings, citing the "Ginsburg Precedent."
- Black Hat stole a nuclear submarine in xkcd 405: Journal 3 to get his hat back from Danish. However, that one was a Russian submarine, and in 2008 (when this comic was drawn), the US Senate would probably not have held that against a nominee. Perhaps they are indeed referencing that incident, or it could be that he has also stolen an American submarine. Stealing one navy submarine would be impossibly hard; stealing nuclear submarines from not one but two different navies would be practically impossible. However, maybe he just asked somebody to help him, or it's possible it was just an American submarine he brought to Russia.
- "Pleading the fifth" is to invoke the Fifth Amendment

of the United States Bill of Rights. Specifically, when someone pleads the fifth, they mean that they cannot be compelled to give testimony against themselves. That is, they do not have to say anything that could be taken as an admission of guilt. The third amendment states that no homeowner has to keep troops of the United States Army in their house against their will. Either Black Hat doesn't understand the 3rd Amendment, he just chooses this amendment over the 5th to confuse the committee, who seems to forget the question, believes the nuclear submarine to be his property, and rather than stealing it, he was simply expelling military personnel who were "quartered" in his nuclear sub without his permission (see xkcd 886: Craigslist Apartments), or he stole the submarine in order to have a convenient place other than his house to quarter troops.

The final panels show Ron Paul's blimp finally approaching Washington DC. The balloon spotted on their radar is presumably piloted by blogger Cory Doctorow, as revealed in the next installment, Secretary: Part 4.

#497: Secretary: Part 4

October 30, 2008



It's time to draw the line.

Explanation

Ron Paul is an American physician, author, and politician who is a House Representative for Texas and is a three-time Presidential candidate, running as a Libertarian and a Republican. He has a very dedicated and vocal base of supporters who believe that he is the only true alternative to either side of the Two-Party System. These supporters go under the name "Ron Paul Revolution" with the letters "evol" reversed to emphasise "love."

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Tron is a movie made by Disney. There is also a joke about Pokémon in the phrase "... evolves into ...". Pokémon is a game where the player, a "Trainer," has

their Pokémon battle other Pokémon to level the Pokémon up. As the Pokémon levels up, they evolve into the next, more powerful, form of the Pokémon. Ron Paul and Cory Doctorow are fighting because Cory Doctorow believes he must support fellow bloggers no matter what, and Ron Paul wants the nomination that Black Hat, a blogger, is getting.

There is a subtle joke in the panel where Ron Paul and Cory Doctorow are firing at each other; the sound effect for Cory's guns is "Boing! Boing!," which is the name of Cory Doctorow's blog. Also, a visual joke is that Cory's turret in panel 5 very much resembles an upside-down Dalek. The latter might not be an intentional joke, however, as Ron Paul's turret is designed the same way as Cory's and the head-mounted 'gun' here is an eyestalk on a Dalek, whose actual weaponry is on a mid-body mounting and not the revolving 'head' element. The quote "Maybe if we dropped all the gold" MAY be a reference to the Firefly episode "Jaynestown", in which Jayne sacrificed his partner in order to escape, before being forced to jettison 60,000 currency.

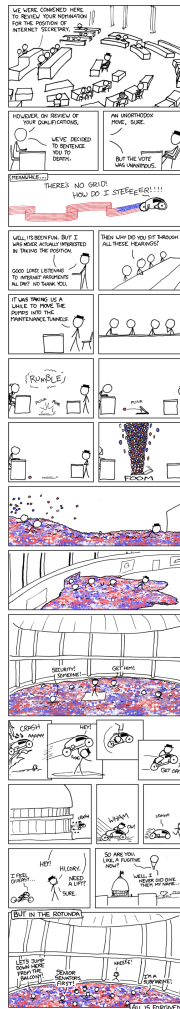
The reference to gold touches on Ron Paul's desire to see monetary policy once again be driven by the gold standard, namely that a country's currency value be driven not by its economic activity, but by the amount of physical gold it owns. Earlier in American history, this was the case; owning a dollar would (in theory) be owning one dollar's worth of gold somewhere in the treasury. This is in contrast with the current international practice, where countries are able to print

an arbitrary quantity of paper money that is not necessarily backed by physical gold. Adherence to the gold standard is an extreme minority view; most economists, and the population at large, agree that the current system is much better. This may also be a reference to the final scene in *The Italian Job*, where the heroes face a decision over losing a large quantity of gold or death, or a reference to *The Mysterious Island*, where the survivors have to drop the gold in their hot air balloon to prevent losing altitude.

The title text refers to the line of virtual light that streams out from the back of *Tron*'s light grid vehicles. Normally it is a single, solid color, but in the comic, it is the colors and form of the American flag to show Ron's patriotism.

#498: Secretary: Part 5

October 31, 2008



And they choose Al Gore as Internet Secretary.

Explanation

This is the fifth and final comic in the Secretary story-arc. The culmination has Black Hat up to his usual shenanigans in the US Senate chamber room. The hearings have ended, with the chairperson deciding to sentence him to death, instead of confirming his position of Internet Secretary. Black Hat replies that he was "never interested in taking the position." This would be quite weird, as Senate confirmation meetings take a long time. The committee members are obviously surprised, and they question Black Hat, trying to get him to reveal his motives. He then cryptically replies that "It was taking us a while to move the pumps into the maintenance tunnels." The confused committee members then look at each other.

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- 497: Secretary: Part 4

• 498: Secretary: Part 5

A red playpen ball bursts out of the panel and rolls towards the committee chairperson, before being followed by a geyser of red, white, and blue balls, which begin to engulf the room and the Senate rotunda. Of course, Black Hat has already escaped by grabbing Tron Paul's lightcycle and using it to smash his way out of the rotunda. Outside the Senate, Cory Doctorow offers Black Hat a lift and asks if he's a fugitive now, and Black Hat replies that they never had his name, which is odd, considering that they know he's stolen a nuclear submarine, along with everything else mentioned in 496: Secretary: Part 3. Back at Congress, they seem to have forgotten about Black Hat's "gleeful mayhem" and are jumping off the balcony into the ball pit below. Playpen balls have been the topic of many comics before, notably in 150: Grownups.

The Senate or a Senate committee, in reality, cannot sentence a person to death, as that would be a bill of attainder, which Congress is prohibited from passing by Article I, Section 9, Clause 3 of the United States Constitution: "No Bill of Attainder ... shall be passed." "An unorthodox move," indeed. Tron was an arcade game, based on the movie of the same name, and both released in 1982. The characters would play on a grid in lightcycles that left behind walls of light. The objective of the game was to force the opponent to run into the wall of light, similar to the Snake game.

The title text refers to Al Gore. Al Gore was the Vice

President under President Bill Clinton and ran as the Democratic nominee for President in 2000. Al Gore has had quite a history with the Internet, including one oft-misquoted (rather, quoted out of context) interview with CNN in which he told Wolf Blitzer, "During my service in the United States Congress, I took the initiative in creating the Internet." Many spun this to mean he claimed to have actually invented the Internet himself, although some of its pioneers clarified what Gore actually meant (that "his initiatives led directly to the commercialization of the Internet") and agreed with this assessment.

#499: Scantron

November 03, 2008



Also, after all the warnings about filling in the bubbles completely, I spent like **30** seconds on each one.

Explanation

This comic is a take on the instructions "Remember to use a #2 pencil on the Scantron" that most modern students in the US have heard many, many times, a warning that seems unnecessary to many because #2 pencils are the most common type of pencil, and most students do not have any other kind. Scantrons are standardized machine-readable papers used by students to answer multiple-choice tests. Often, the instructor will remind students to use a #2 pencil, which is a US classification of pencil hardness and equivalent to the HB term that is used in Europe. #2 pencils use a medium-hardness graphite considered ideal for Scantron use because the graphite is soft enough to leave a dark mark but hard enough to not smudge, both aspects that improve the performance of machine-readable paper. Miss Lenhart seems to have given her class one of these tests.

The joke is that the student used a #3 (or 'H') pencil, which has a slightly harder graphite rating, as opposed to the #2. Instructors and examiners usually place great emphasis on using a #2 pencil, as if not using one would lead to dire consequences, but without explaining why. The comic jokingly suggests that these consequences would include causing the grading machine to explode, killing seriously harming people nearby and leaving a bloody mess.

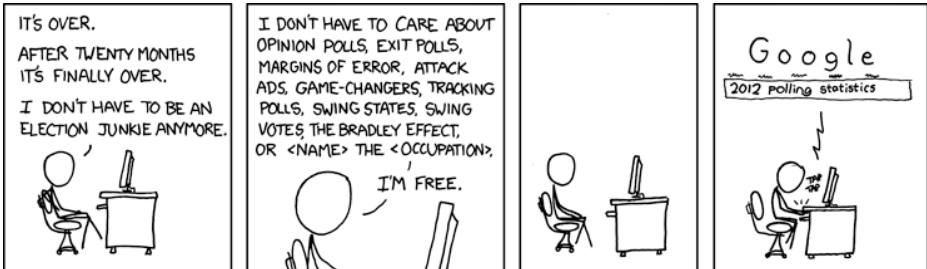
The title text refers to the instruction to "fill in all the

bubbles completely." This again improves the performance of machine-readable paper. The student states that he spent an inordinate amount of time making sure his markings were perfect because he had been warned so many times to do so, but five seconds is usually enough.

This is the first of only two comics where Miss Lenhart is both drawn and named, the second being 1050: Forgot Algebra.

#500: Election

November 05, 2008



Someday I'll be rich enough to hire Nate Silver to help make all my life decisions. 'Should I sleep with her?' 'Well, I'm showing a 35% chance it will end badly.'

Explanation

This comic was published the day after the 2008 presidential election in the US. Cueball has been closely following the quantitative aspect of the election for over a year and a half, and he seems to be relieved that it's over. Now that the election has passed, he does not have to follow the many different opinion polls, number-crunching analyses, and news clips about people like Joe the Plumber that he has kept close track of during the election season. As soon as he says this, however, he starts to search for information on the 2012 election, suggesting that his political obsession has not at all passed.

A list of the elements Cueball had been thinking about:

- Opinion polls: These are simply surveys of voters' opinions on various issues and who they plan to vote for. They tend to be the primary source for predicting the outcome of elections as they can be created well in advance.
- Exit polls: These are surveys conducted with people who have just voted. They are useful as they provide data at the very last minute, so that no other unforeseen circumstances can affect people's decisions (and undecided is no longer an option). However they are not available until the last minute, and can be more biased than opinion polls.
- Margins of error: As censuses are expensive and

ultimately pointless, given that the election is effectively a big census, with "did not vote" as an option, pundits (or "talking-heads") use surveys, which involves just interviewing a hopefully representative random sample of voters. This, however, means that the surveys results are not likely to be quite the same as an equivalent census. A margin of error reflects how much variation could likely be expected. Due to the fact that a sample was used, they do not cover issues such as a sample being unrepresentative.

- **Attack ads:** Attack ads are a form of political campaigning where rather than emphasizing their own qualifications and attributes, a candidate or a group affiliated with the candidate tries to convince voters that their opponents are unsuitable for the office.
- **Game-changers:** Game-changers are events that pundits claim will lead to significant changes in polls. During an election season, at least one election event a month for each candidate is promoted as a "game-changer" by the media. In actuality, it usually has no effect on the outcome, as most voters are already decided in US presidential elections.
- **Tracking polls:** A tracking poll is a poll repeated at intervals and averaged. For example, a monthly tracking poll uses the data from the past month and discards older data.
- **Swing states:** In the United States, several states have significant support for one party, and hence due to the fact that the electoral college gives all of a state's vote to a single candidate, small changes in votes do not change

the party that has the majority of the vote, and hence does not change who receives that state's electoral college votes. Other states that have near equal support for each candidate are referred to as swing states, and they are particularly interesting for pundits, as relatively small changes in votes can have significant effects on the end result.

- **Swing votes:** Swing votes are similar to swing states, except that they refer to groups of people. If there is a significant social group, a large segment of which could possibly vote for either side, they are of particular interest for pundits.
- **Bradley effect:** The Bradley effect is a theory that in elections containing a minority candidate, polls will often tend to overstate their level of support. It is theorized that this is due to people not wanting to appear racist whilst being surveyed, so some people who support a non-minority candidate may either claim to be undecided or plan to vote for the minority candidate. However, as voting is private, at that point they may reveal their true preference. The effect is named after Los Angeles Mayor Tom Bradley, an African-American who lost the 1982 California governor's race despite having appeared to have a significant lead in the opinion polls. This effect was particularly interesting for pundits in the 2008 US Presidential Election because of the running of Barack Obama, the first African-American presidential candidate. As there was no precedent for this at this level, some pundits were concerned about how much

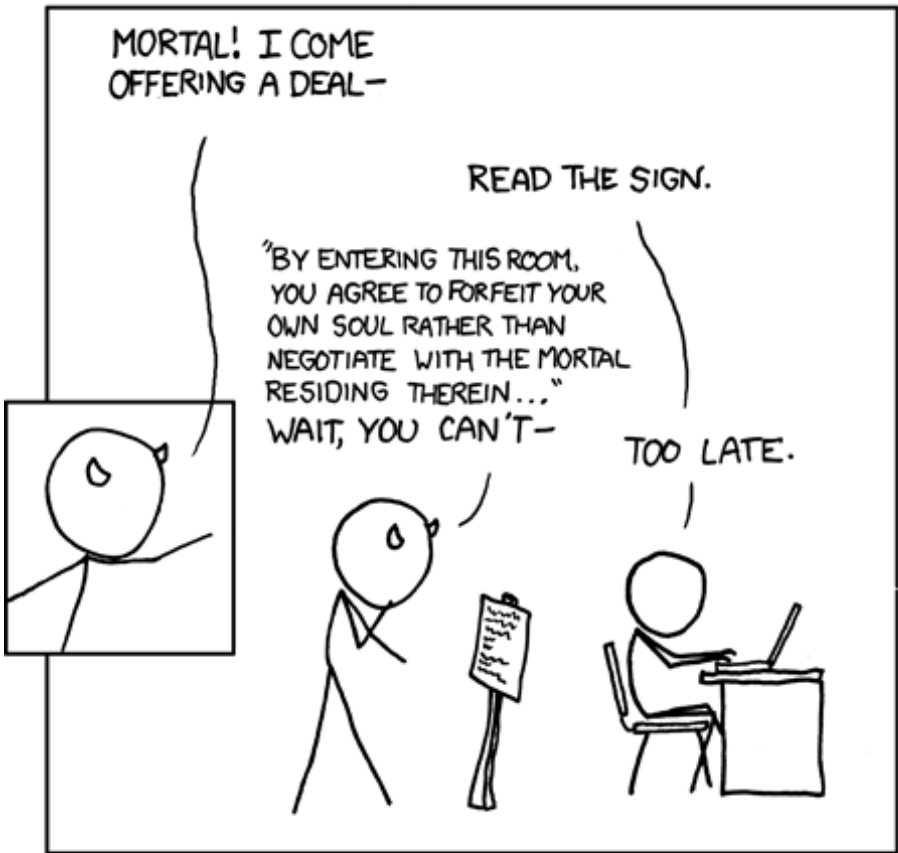
of his lead in the polls might be due to this effect.

- <name> the <occupation>: A significant event in the 2008 US Presidential Election was a question proposed to the then Democratic nominee Barack Obama by Joe the Plumber. This promoted a variety of hitbacks and counter-hits. Cueball is referring to the tendency of the media at the time to refer to many critics of the two candidates using the snowclone "<name> the <occupation>," where <name> is replaced by the person's first name and <occupation> by their occupation (e.g. "Brad the Masturbator").

The title text is about statistician Nate Silver, who became something of a geek celebrity for his analysis during the campaign. He correctly predicted the outcomes of 49 of the 50 states in the 2008 election on his blog. It jokes that having him predict the outcomes of life decisions would make choosing the best thing to do very easy. So if Cueball ask Nate - "Should I sleep with her?", then Nate could give him a forecast like this: "Well, I'm showing a 35% chance it will end badly." Later, in 2016, Nate Silver's website, FiveThirtyEight, launched an advice column thus making the title text partially come true.

#501: Faust 2.0

November 07, 2008



MEPHISTOPHELES ENCOUNTERS THE E.U.L.A.

The only blood these contracts are signed in is from me cutting my hand trying to open the goddamn CD case.

Explanation

E.U.L.A. is short for End-user license agreement, a license that software makers often attach to their software but people do not usually read. Agreement to an E.U.L.A. is assumed when a user uses the software or service that the E.U.L.A. is attached to, which has led a case where users have unknowingly actually agreed to give away their immortal souls because of a clause in an E.U.L.A. However, in the European Union, all provisions of these agreements that aren't already codified in law actually are not legally enforceable, unless they could be read and agreed to before purchase and first use.

A Faustian deal is done by someone who sells his soul to the devil for something desired in this life, a textbook example of wanting instant gratification. The mortal will get the things he wanted, but when he dies, he will have to suffer eternal torment. As the span of a human lifetime is an eye-blink compared to eternity, this is a really stupid thing to do.[citation needed] It is named after the folkloric character Faust, whose story has been the subject of numerous adaptations.

In this comic, Cueball turns an E.U.L.A. around on Mephistopheles, the demon Faust sells his soul to in the stories, by posting a sign saying that anyone entering the room agrees to turn over their own immortal soul rather than negotiate with Cueball for his. It is unknown whether this clause applies only to demons or to

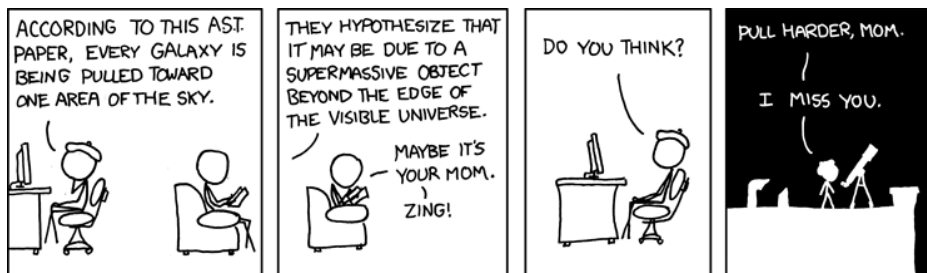
everyone, which would be quite horrifying.

The title text makes reference to how easy it is to cut open one's own hand while trying to open a newly-bought CD case. Incidentally, a pen works just fine, though the blood is referencing how Satanic contracts are signed in blood. The only blood on the E.U.L.A. contracts that Randall "signs" by opening a CD is the blood coming from when he cuts himself like this.

A short time later, a similar demon was depicted in a similar fashion in 533: Laptop Hell, although with a trident and in Hell. Although not mentioned in the comic, he was also named Mephistopheles in the official transcript.

#502: Dark Flow

November 10, 2008



The Pioneer anomaly is due to the force of my love.

Explanation

This comic is about astronomy and the Your Mom jokes that have become increasingly widespread in urban parlance. Beret Guy is reading a research paper presumably discussing Dark Flow, an observed anomaly in the motions of the galaxies that some theorize is caused by an unobservable sibling universe or similarly supermassive object beyond the edge of the visible universe. Cueball sees this as an opportunity to make yet another Your Mom joke, implying that Beret Guy's mother is fat.

But apparently, Beret Guy's mother is dead, or at least missing, and he takes the joke seriously. He looks toward the sky and wishes that his mom pull harder so that he could be with her. The joke has been turned onto itself.

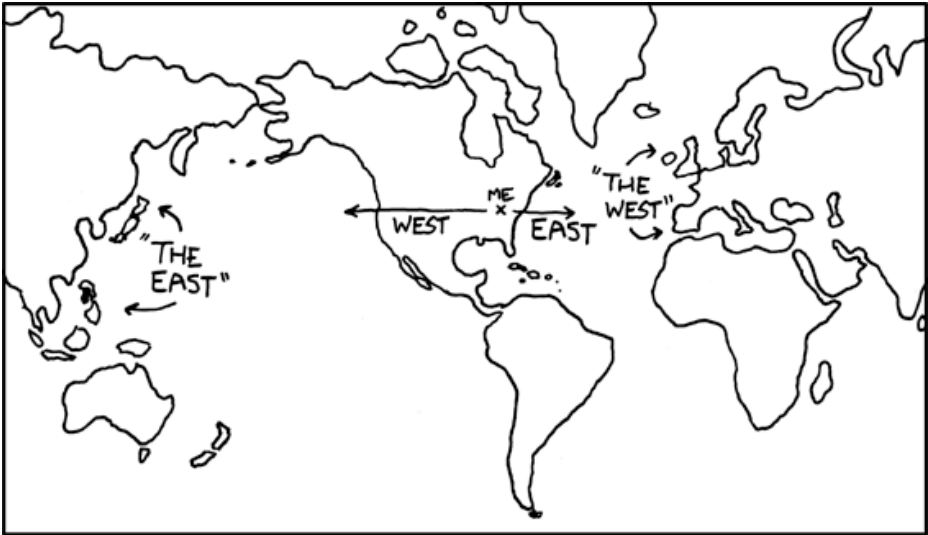
The title text is a continuation of Beret Guy's thoughts and refers to another piece of science phenomenon that has been observed in space, the Pioneer Anomaly. The Pioneer 10 and Pioneer 11 spacecraft had been slowed down by an (at the time) unknown force as they exited the solar system, which he says is caused by the force of his love, probably toward his mom. This force has since been explained entirely in 2012 by the probes being decelerated by thermal radiation.

In 2310: Great Attractor, thanks to "galactic motion and how many dimensions [his] bones have", the more local Great Attractor is pulling Beret Guy so hard that he can

sleep on vertical surfaces when it is close to the horizon.

#503: Terminology

November 12, 2008



THIS ALWAYS BUGGED ME.

Also, is it just me, or do Japan and New Zealand look suspiciously similar? Has anyone seen them at a party together?

Explanation

This comic shows an approximate Mercator map of the world. The X in the center, labeled "ME," indicates Randall's approximate location in the U.S., and two arrows point west and east from it. The map uses a format, popular in America, that places the American continents centrally, therefore splitting Asia. The comic then shows Europe labeled "The West" as it is commonly referred to, despite being located to the east of Randall, and Asia similarly labeled "The East", despite being west of Randall. Randall is therefore annoyed with the common terms "the West" and "the East" referring to locations east and west of him respectively.

"The East" and "the West" were defined in geographical terms from the traditional boundary between Europe and Asia. They were later expanded or (mis-)appropriated to include references to cultural, racial, political, and trade connections. Another east-west division comes from zero longitude (the prime meridian): the Western Hemisphere and Eastern Hemisphere are defined in reference to it, and world maps are often centered on it. The fact that the prime meridian runs precisely through the Greenwich Observatory, in London, is an artifact of the British Empire's dominance —and British exploration of the world— in the 1700s and 1800s. In particular, British astronomical tables (made by the Royal Observatory in Greenwich, London) were widely used to determine longitude all over the world. The need for establishing a

precise zero-longitude is one of the two technological necessities to make a sextant work as a tool to calculate accurate position for map making.

In short, "the East" and "the West" as terms in common usage refer to map coordinates and not to positions relative to where you are (The interpretation presented in the comic). An America-centered map does not redefine "the East" or "the West" anymore than an Australian up-side-down reversed map redefines "the North" or "the South".

The convention of orienting maps with north at the top and west at the left was started by the Greek geographer Ptolemy. In his work *Geography*, he introduced the first coordinate system with latitude and longitude. Randall shows some other possible map orientations in 977: *Map Projections*.

The title text comments on the similarity in shape of New Zealand and Japan, and he suggests that one may in fact be the other in disguise, much like Clark Kent and Superman, as well as similar superhero alter ego pairs. The similarities between New Zealand and Japan are partly explained by the fact that both formed as volcanic island chains.

#504: Legal Hacks

November 14, 2008



It's totally a reasonable modern analogue. Jefferson would have been all about crypto.

Explanation

Megan notices that an Internet Service Provider (ISP) is blocking access to some webpages. Cueball is thankful that cryptography offers a way around such censorship.

Encryption, the study and use of which is known as "cryptography," or "crypto" for short ("crypto" in more recent years has tended to be short for "cryptocurrency", but not in this case), is the art of transmitting messages that can only be read by the intended receiver(s) by using mathematical techniques to conceal ("encrypt") the data in the message. One common and effective way to encrypt messages is the RSA algorithm, which is based on the difficulty of integer factorization for products of two prime numbers.

Being able to share unbreakable codes and decrypt other people's codes gives countries a military advantage - for example, in World War II, the Americans and British were often able to figure out where a German attack would be coming and send reinforcements there, because they had cracked the German codes. Because of this, the United States government initially tried to keep the mathematical details of strong encryption algorithms (including RSA) inside the country by classifying the algorithms as a weapon. It is a crime to share certain kinds of weapons technology with other countries without permission. Amateur and professional cryptographers, angry about the attempt to restrict their work, lobbied the government to change the rule and

stop treating cryptography as a weapon, in part so that they could continue to collaborate with colleagues overseas, and in part because they wanted the ability to pass secret messages that the government could not easily decrypt. The export restrictions were gradually loosened and would have mostly been lifted by the year 2000.

In the comic, Megan makes the provocative and counter-intuitive point that perhaps the cryptographic community could have best ensured easy access to the RSA technique by *allowing* the government to treat RSA as a weapon, and then, once everyone is certain that RSA is a weapon, invoking the Second Amendment to the United States Constitution, commonly known as the "right to bear arms" amendment (that is, the right to own and use weapons). In other words, if RSA were a weapon, it would be granted constitutional protections.

This interpretation is likely a reference to the very strong social and political movements opposing arms control in the United States. The legal basis for this movement is the position that most or all laws prohibiting private ownership of firearms (and potentially other weapons), violate the Second Amendment. Accordingly, publicly referring to the Second Amendment tends to imply opposition to gun control. Megan's implication is that, by connecting RSA to this debate, crypto enthusiasts would gain a large group of unlikely allies who are strongly committed to keeping weapons legal and unrestricted. They could also invoke the legal cover of the Constitution, allowing them to fight restrictions in court.

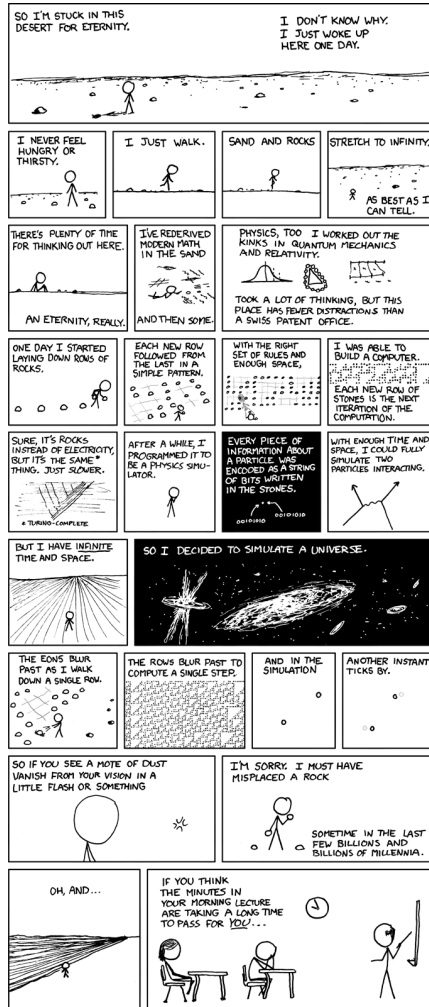
Cueball is surprised and impressed by this point, and pauses to contemplate Megan's strategy.

It should be noted that there are major weaknesses in this argument. The Second Amendment only applies in the United States, meaning that imports and exports of munitions could still be banned. It might provide some protections against the ability of the US government to restrict RSA within US borders, but it could still be restricted in other countries, potentially hampering its use in global communications.

The title text claims that this is a reasonable interpretation of the Constitution, because cryptography (a modern weapon) is analogous to muskets and cannons (the weaponry in use in the 1780s, when the Second Amendment was drafted). As evidence for the analogy, the title text points out that Jefferson would have been a big fan of cryptography, which is plausible, because President Thomas Jefferson (the 3rd President of the United States) was an amateur scientist who enjoyed studying a very wide variety of fields (in fact, he invented the Jefferson disk, an encryption device that was quite advanced for its time). The point is somewhat facetious, because it is hard to imagine a modern technique that Jefferson would not "be totally into." Also, the mere assertion that an early President would have been a fan of a technique is not very good evidence that the technique would be legally permitted by a particular Amendment.

#505: A Bunch of Rocks

November 17, 2008



I call Rule 34 on Wolfram's Rule 34.

Explanation

Cueball awakens to find himself trapped for eternity in an endless expanse of sand and rocks. At first, he uses this time to derive all of mathematics and physics, plus more, including quantum mechanics and general relativity. Next Cueball creates a computer that can process any possible function, out of rocks and rules for the interaction between rocks. He then simulates a particle followed by the interactions between particles, followed by the entire universe. The amount of time it takes to simulate the change in the universe merely from one instant to the next takes is extremely long, as the time it takes to update just one row of rocks would be eons, assuming a realistic time to place each rock.

Cueball is using the rocks to build a cellular automaton, a computational model based on simple rules to advance from one state to the next. Certain cellular automata are Turing-complete, which means that they can be used to represent any conceivable algorithm if expanded infinitely, including simulating the physics of the universe. He specifically seems to be running Wolfram's Rule 110, which is capable of universal computation. When using Rule 110 for universal computation, one builds a background pattern, which can be seen in the comic as the pattern of smaller triangles, and then performs computation by sending out "rockets" to collide and interact with each other. Cueball can simulate the functioning of an entire universe because he has unlimited time and space (and rocks).

Cueball then apologizes for any flaws we see in the simulation. This implies that the audience is living in Cueball's simulation, making Cueball essentially God, and that he might make mistakes along the way. The final frame cuts to a classroom where a bored student stares at his hands waiting for class to end. Cueball admonishes the student for thinking that class is lasting forever, the joke being that the boredom felt in a classroom is nothing compared to the boredom that inspires Cueball to spend his endless time toiling to keep the universe moving. Indeed, the minutes of lecture actually took many "billions and billions of millennia" for Cueball to simulate. Another possible explanation is that the entirety of this comic is a fantasy in Cueball's mind as he zones out during a math lecture.

The Swiss patent office line refers to Albert Einstein, who was employed as a Swiss patent clerk while coming up with his theory of special relativity. This joke is also referenced in 1067: Pressures. Also, there is a standing joke that very few important inventions have come from Switzerland, since the country hadn't been involved in the world wars, and thus has not been part of the weapons race, nor was it a driving force in the preceding Industrial Revolution. In the center of the comic, the binary numbers pointing to the particle are both 42. This is a reference to the comedic answer to the Ultimate Question of Life, the Universe, and Everything from the *The Hitchhiker's Guide to the Galaxy* series.

Cueball mentions that if we see an artifact flutter in and out of reality, he must have made a mistake in the last

"billions and billions of millennia." This implies that the small period of time the artifact is present in his time is much longer than our universe has existed. That is a very long time. However, because it was a really long time, the difference could be more than just a small mote of dust disappearing. It is also possible, however, that it took billions of years to simulate an instant in our universe.

The line "I've rederived modern math in the sand and then some," is possibly referring to "Surreal Numbers: How two ex-students turned on to pure mathematics and found total happiness" by Donald Knuth, in which a young couple finds themselves stranded on a deserted island (similar to Cueball), and spend much of their time deriving the properties of surreal numbers from a few base axioms.

The title text suggests that Rule 34 should be called on Wolfram's Rule 34. Rule 34 (see 305: Rule 34) is a humorous rule of the Internet that states, "If you can imagine it, there is porn of it. No exceptions." Wolfram's Rule 34 is a cellular automaton. Therefore, the title text says that either someone has made pornography featuring the cellular automaton in question, or someone has used the cellular automaton to produce pornography. Which, of course, Cueball in the comic has, since his universe presumably contains naked people. And literal pornography.

From xkcd: volume 0:

Graphs[edit]

The three diagrams in the "Physics, too. I worked out the kinks..." panel are, from left to right:

The graph that represents particle interaction is a Feynman Diagram. This shows the interaction of subatomic particles that collide and exchange some momentum via a photon. The slope of the middle line represents the distance moved and the time lost/gained during the interaction.

#506: Theft of the Magi

November 19, 2008

HEY. I SOLD YOUR ROOMBA
ON CRAIGSLIST SO I COULD
BUY MYSELF *LEFT 4 DEAD*.

BUT I EBAYED YOUR XBOX
SO I COULD GET THIS DUELING
HARNESS FOR MY ROOMBA!

AWW.

AWW.



Every Roomba needs a dueling harness.

Explanation

This comic is a satirical play on O. Henry's short story "The Gift of the Magi." In O. Henry's story, a couple with very little money goes to great lengths to purchase gifts for one another. The wife sells her prized possession, her hair, to purchase a fancy chain for her husband's prize possession, a watch; the husband sells his watch to purchase some fancy hair accessories (clips/combs) for his wife. The story is about selflessness, as each party sold their prize possession to purchase something to enhance the other's prize possession.

In this comic, however, the opposite occurs: Black Hat stole Danish's Roomba (an autonomous robotic vacuum cleaner) and sold it to buy a new game for his Xbox, while Danish stole Black Hat's Xbox and sold it to buy a "dueling harness" for her Roomba, highlighting their mutually destructive selfishness. Although these actions reflect their sociopathic personalities and are at each other's detriment, both are apparently touched by the symmetry of their actions and consequences, and both find their mutual selfishness to be appealing. This is a reversal of the typical reaction to the O. Henry story: although neither of the characters in that story can actually use their gift, the gifts are touching nevertheless because they represent the self-sacrificing love the characters have for each other.

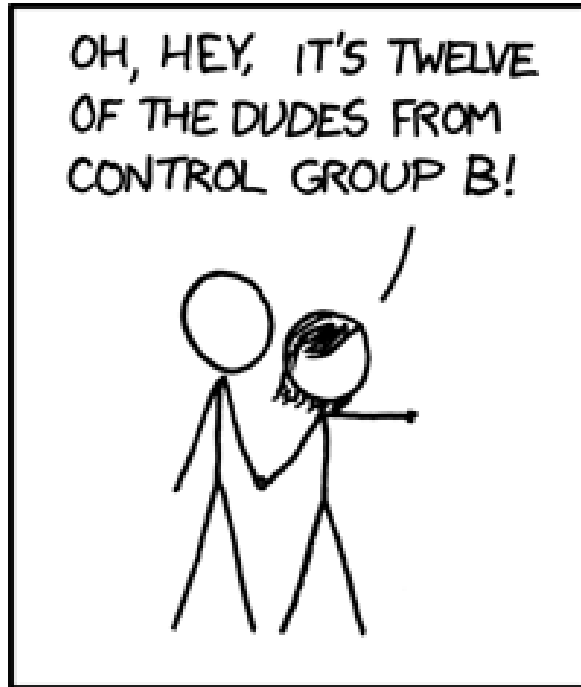
An alternative interpretation is that the word "AWW.", rather than an expression of being touched, is an

expression of disappointment. Thus they are each disappointed by the turn of events.

The "dueling harness," also mentioned in the title text, is an invention by Randall, which presumably would allow Roombas to wield weapons and battle each other like the robots in Robot Wars.

#507: Experimentation

November 21, 2008



I'M COOL WITH HER PAST
LESBIAN EXPERIMENTATION,
BUT I WISH SHE HADN'T
INSISTED THE EXPERIMENTS
BE SCIENTIFICALLY RIGOROUS.

I understand large sample sizes are key to a low standard error of the mean, but the entire sophomore class?

Explanation

College (undergraduate university, for international readers) is often a young adult's first experience with independent living. As a result, it is a time to "find yourself," so the aphorism goes. This often includes a certain amount of sexual experimentation, including same-sex experimentation.

This comic applies a scientific interpretation to a colloquial expression (a favorite on xkcd). Usually, "lesbian experimentation" refers to a woman engaging in one-night stands with other women to satisfy her curiosity about the experience and discover her own sexual orientation. Megan, however, does the "experimenting" according to the scientific method: hypothesize, experiment, draw conclusions, repeat. She formulates a hypothesis about her sexual orientation (apparently something along the lines of "I am a lesbian"), which she proceeds to test by experiments (sexual encounters) with female partners as the experimental group and male partners as the control group. She used large sample groups and multiple experiments (the reference to "control group B" implies at least two separate experiments). The title text implies that Megan "experimented" with the entire sophomore class (both males and females) before dating Cueball.

#508: Drapes

November 24, 2008



Wait, what?

Explanation

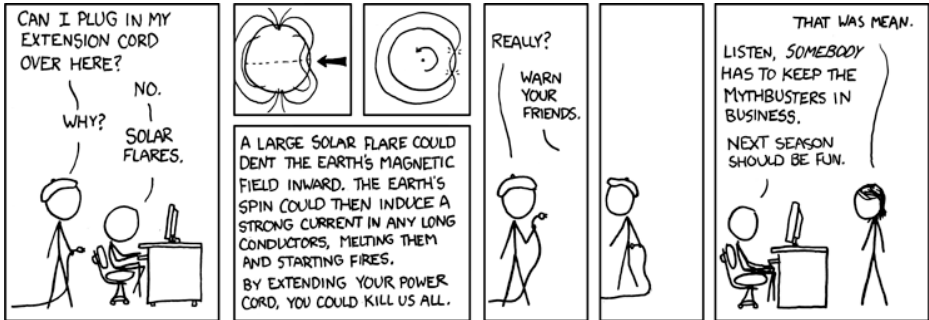
This comic plays on the classic question "does the carpet match the drapes," where the 'drapes' are the hair on someone's head, and the 'carpet' is their pubic hair. The assumption is that some people artificially dye their head hair, but typically would not dye other body hair, essentially asking "Are you a 'natural' red-head/blonde/etc.?" The classic question doesn't mention upholstery, hence Cueball's confusion in the title text. There is some speculation about other body/arm/leg/arm-pit hair interpretations for upholstery.

This comic could also be a self-referential joke where the furniture is a double entendre to the art of the comic itself. The "carpet" is the white background of the comic, which matches the black "drapes" of Cueball, the woman, and the words. The "upholstery," in this case, is the woman's hair, which is colored and heavily bordered to create a 3D effect, which does not at all match the rest of this comic. The fact that Cueball seems confused (as per the last panel and title text) suggests that the fourth wall may have been broken.

Alternatively, it could be that the woman is wearing a wig, and the "upholstery" is her natural hair or something similar, or the woman is talking literally about her home's decoration.

#509: Induced Current

November 26, 2008



The MythBusters need to tackle whether a black hole from the LHC could **REALLY** destroy the world.

Explanation

This comic is exaggerating the effects of the physics stated. Solar flares eject, among other things, ions, electrons, and radiation. The charged particles reach Earth after a day or two, and in history has knocked the power out in some areas during a large flare. They can marginally affect the magnetic field of the Earth, or dent it, as Cueball says. A voltage occurs in a conductor (the wire) when subjected to a changing magnetic field. However, this change is small and influences only very long conductors, such as telephone lines.

Interestingly, phenomena as described by Cueball have occurred several times in recorded history, with effects quite nearly like those described, most notably the Carrington event of 1859. In 1859, a solar storm produced a series of powerful geomagnetic storms across the world, and many telegraph operators reported electrical phenomena (electric shock from the apparatus, messages sent and received despite disconnect from power sources, and pylons carrying telegraph lines sparking and arcing with current) all across North America. For this to occur in shorter conductors, (e.g., Beret guy's extension cord,) a solar storm would have to be so destructively large as to pose far more danger than just fires. The chances of such a solar event occurring again are not prohibitively small, though quite infrequent, and the last one, of comparative size and strength, was recorded in 2012.

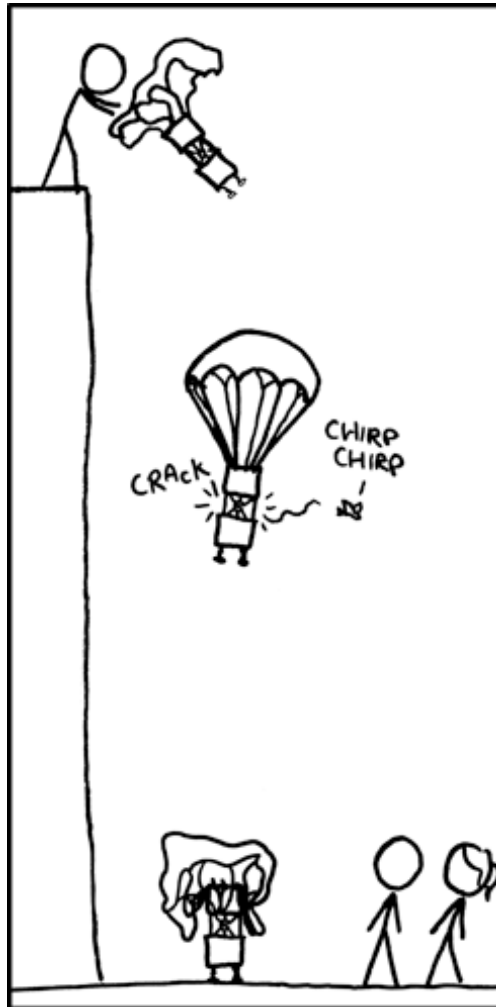
Ironically, Cueball convincing Beret Guy that this would happen may lead to it actually happening within Beret Guy's vicinity; he has repeatedly demonstrated many strange powers, and the laws of physics tend to bend themselves around him in order to fit his perceptions of the universe.

Mythbusters is a show that tests urban legends or myths that viewers submit. They have a classic style of scaling up myths to comical sizes. By starting the myth that a fire would be formed from the large voltage across the wire induced by the Earth's magnetic field, Cueball hopes to see it tested on Mythbusters, and perhaps then scaled up to astronomical proportions. This comic may also reference how Mythbusters was running out of urban legends to test, and has resorted to testing the feasibility of viral videos, movie scenes, proverbs, and the like, plus occasionally making up urban legends.

The title text refers to the Large Hadron Collider (LHC), the most powerful particle collider in the world and the fear of some people of the production of stable microscopic black holes destroying the Earth. Of course, testing something like this would be outside the scope of a show like MythBusters. Additionally, if the myth was confirmed, the planet would be destroyed, and nobody would like the MythBusters anymore.[citation needed] However, that wouldn't be much of a problem, seeing that there would be no one around to like anything.

#510: Egg Drop Failure

November 28, 2008



I hear my brother Ricky won his school's egg drop by leaving the egg inside the hen.

Explanation

A common competition for school-age children (e.g. in science fairs or summer camps) is the 'egg drop': each team is given an unbroken egg (either raw or boiled, and usually of a chicken), and may be provided with an assortment of materials, e.g. newspaper, popsicle sticks, string, tape, etc. The challenge is to build a contraption that will allow the egg to be dropped from some specified height onto a hard surface without breaking. In some competitions, the rules permit the contraption to be constructed from any available materials; other times, it is limited to only the materials that have been provided. Scoring varies wildly - common elements are speed of assembly, mass of the contraption, creativity of design (as determined by judging or voting), and/or accuracy of landing within a target area - but one near-universal rule is disqualification if the egg's shell is broken.

In the comic, the competitor fails, not because of any flaw in his design, but because the egg hatches unexpectedly during the fall. In reality, the hatching process usually takes many hours — much longer than the few seconds of a typical egg drop; furthermore, the newborn chick cannot fly immediately. However, if it were to magically happen as in the comic, then the competitor would be disqualified because the egg technically broke when the chick hatched from it.

The title text suggests an alternate strategy, one Randall hears was successful in real life: select for your egg one

that has not yet been laid. The hen provides both active lift with her wings and significant padding with her body and feathers, thus nearly guaranteeing that the egg will survive the fall. But the chicken may not be permitted in some contests if it is not one of the allowed materials. And even if it were, a chicken might be heavier than the usual contraptions of newspaper and string,[citation needed] so it might lose anyway if weight is one of the scoring criteria.

#511: Sleet

December 01, 2008



I mean, I can barely hear myself complaining about Battlestar Galactica.

Explanation

Megan is seen leaving an apartment, trudging through freezing temperatures and foul weather, when she could be in a warm, cozy bed. The dialog is likely her thoughts, rather than speech. She is fed up with the second person's endless discussion of digital rights management (DRM). She probably agrees with his position, but would rather face the weather than his endless rehashing of the issue.

The words in the first panel are the opening lyrics of the Christmas standard, Let It Snow! Let It Snow! Let It Snow!.

In the last panel, Free Culture refers to a book by Lawrence Lessig, who advocates for fewer restrictions in many areas. Randall had previously advocated this title himself in 86: Digital Rights Management and 129: Content Protection, and mentioned Lessig in 343: 1337: Part 3.

In the title text, it is revealed that Megan herself is also guilty of droning on about 'boring' subjects, likely to the annoyance of those around her. In this case, complaining about science-fiction TV series Battlestar Galactica, which tends to produce strong reactions among geeks. She has gone outside to avoid the boring rant. However, given the opportunity, it is she who would be doing the ranting.

#512: Alternate Currency

December 03, 2008

WITH THE COLLAPSE OF THE DOLLAR, THE GOVERNMENT
HAS ENDORSED AN ALTERNATE CURRENCY.
YOUR MONETARY WORTH IS NOW DETERMINED BY THE
NUMBER OF FUNNY PICTURES SAVED TO YOUR HARD DRIVE.



I HAVE BEEN PREPARING FOR THIS MOMENT MY WHOLE LIFE.

For the first time ever, the phrase 'I'd like to thank everyone at 4chan for making me successful and happy' is uttered.

Explanation

Cueball is shown watching television, where it is announced that the US dollar has collapsed and been replaced by an 'alternative currency' of humorous pictures commonly shared on the internet (an Internet Meme). Such a currency would be utterly useless; for untraceable and easily counterfeited .gif and .jpeg files to become more monetarily stable than the US dollar would mean that the economy is all kinds of screwed, to the point of utter absurdity.

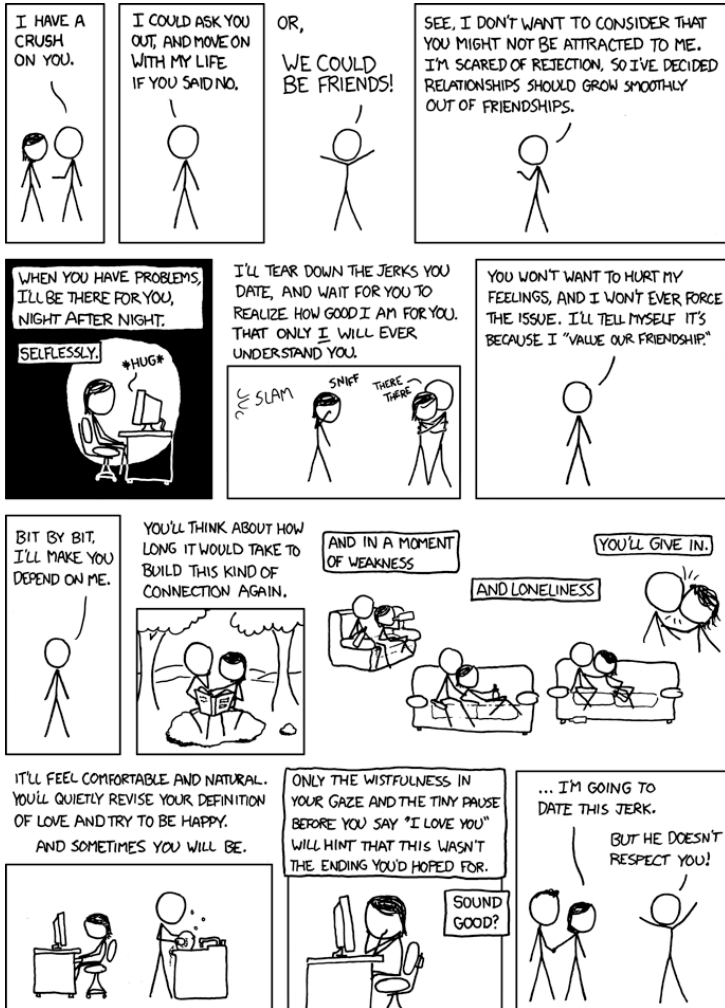
The title text pokes fun at users of 4chan who are notoriously known for their habit of hoarding image macros, a practice he suggests is almost useless except in the instance jokingly suggested by the comic. 4chan is also reputable for reducing the happiness and success of many people their community targets anonymously. Randall also pokes fun at himself in saying, "I have been preparing for this moment my whole life," implying he is also guilty of this practice.

The "rare pepe" meme that has recently sprouted on 4chan implies that some photoshopped pictures of Pepe the frog are valuable and that they could be sold. 120 Rare pepe's reached a price of \$99,166 on eBay before being removed as seen here.

With the rise of cryptocurrency and NFTs, this absurdist comic now holds a certain degree of truth, despite the struggles crypto has faced.

#513: Friends

December 05, 2008



Friends with detriments.

Explanation

Cueball is talking to Megan. He confesses that he has a crush on her. Usually the next step in Western cultures, when someone likes someone else, is to ask the other person out (in other cultures, such as Islamic or Indian cultures, it would be more appropriate to request that one's parents contact the parents of the person one has a crush on). But Cueball takes a different route, and in the comic, he explains his thought process. Presumably he actually explains this to Megan.

He explains that he is afraid of rejection, and so instead of asking her out directly, promises to be her "best friend" and someone who is always "there for you," in the hopes that this will eventually lead to Megan developing an attraction for him. This way, Cueball does not have to risk Megan saying 'No' to him, as she will be led to make the first move instead. Cueball is aware that this may not be an ideal situation for Megan, conceding that she may end up changing her definition of happiness to make her feel more comfortable in the relationship, while she is conscious of the fact that she doesn't really love Cueball. Cueball recognizes that if Megan fell for him this way, she would probably have this fact at the back of her mind forever.

And so, after painting this elaborate - but troubling - future, Cueball asks sound good? Megan, however, is not won over by Cueball's plan, and she tells him that she is going to date "this jerk", poking fun at him saying 'I'll tear

down the jerks you date'. This suggests that she would much rather date someone else rather than date Cueball whom she -- as he correctly implies -- does not love.

Cueball declares that the other suitor doesn't respect you, an absurdly hypocritical comment given his manipulative plan. He explained earlier that he would tear down the jerks you date; this last line could also be him actually executing on the plan he just detailed.

The title text is a play on the concept of friends with benefits, wherein two friends have casual sex without entering a committed relationship. Friends with detriments suggests that having Cueball as her "friend" damages Megan's chances of getting a relationship (and sex) with anyone else, since Cueball will tear any candidate down. Also, despite Cueball claiming to be Megan's friend (and appearing to value this friendship), his plans are rather selfish and manipulative, making him a "friend" who is in fact detrimental.

#514: Simultaneous

December 08, 2008



A COMMON DISAGREEMENT WHEN
ONE OF YOU IS DOING ALL THE MOVING.

I'm leaving you for your twin. He's more mature than you
by now.

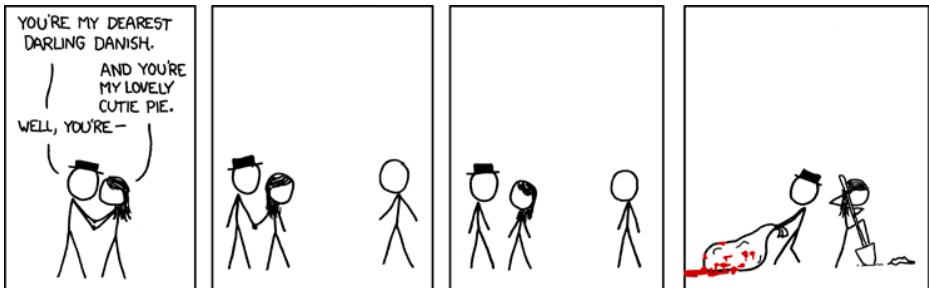
Explanation

Cueball and Megan are talking about the sex they just had. Cueball is remarking on how they both achieved orgasm simultaneously, but Megan disagrees. This comic is a play on Einstein's theory of special relativity. One piece of the theory deals with two observers who are moving at close to the speed of light relative to each other. According to Einstein, events that appear simultaneous to one observer will appear to happen at separate times to the other. So when one partner is moving and the other isn't, it's possible that they experience their orgasm at different times relative to each other. That would require one partner to be moving really fast in one direction, which would make them a really bad partner.[citation needed] On small speeds, this effect could not be measured. The other joke is that partners often disagree with each other — even when the difference is minor and not important to the matter.

The title text is reference to the twin paradox, which arises from another piece of special relativity. In theory, if you stick one twin on a spaceship at near light speed and keep the other back on Earth, and assuming neither accelerates, each will perceive himself to age slowly while the other ages quickly, forming an apparent paradox. Megan expresses a preference for Cueball's older twin, who will be more "mature," meaning both older and presumably less combative about simultaneity. Again, the joke here is that at relativistic speeds, there could be disagreement about which twin is truly the "older" one.

#515: No One Must Know

December 10, 2008



Or perhaps they knew he was there, and were just trying to torment him first.

Explanation

Black Hat and Danish are more known for sociopathy than affection. In the first panel, they are affectionate towards each other, holding hands and using terms of endearment, i.e. danish pastry and pie. This behavior is common with couples but unexpected coming from these normally cynical characters. (However, 433: Journal 5 confirms that they are dating—so the surprise here is their unusually affectionate language rather than their relationship.) The entrance of Cueball and his subsequent discovery of them in this state prompts Black Hat and Danish to kill him. Their return to their more typical behavior contrasts with the first panel, presumably motivated by a desire to either dissimulate the warmer aspects of their personalities or their relationship altogether.

The title text provides the alternative hypothesis that they were planning on killing him the whole time and were intentionally acting affectionate for the mental effect it would have on their victim.

542: Cover-Up provides a possible continuation of this story.

#516: Wood Chips

December 12, 2008



MY HOAXES NEED TO GET A LOT LESS SUBTLE.

You didn't run a chemical analysis against the Shroud of Turin? Man, all that work for **NOTHING**.

Explanation

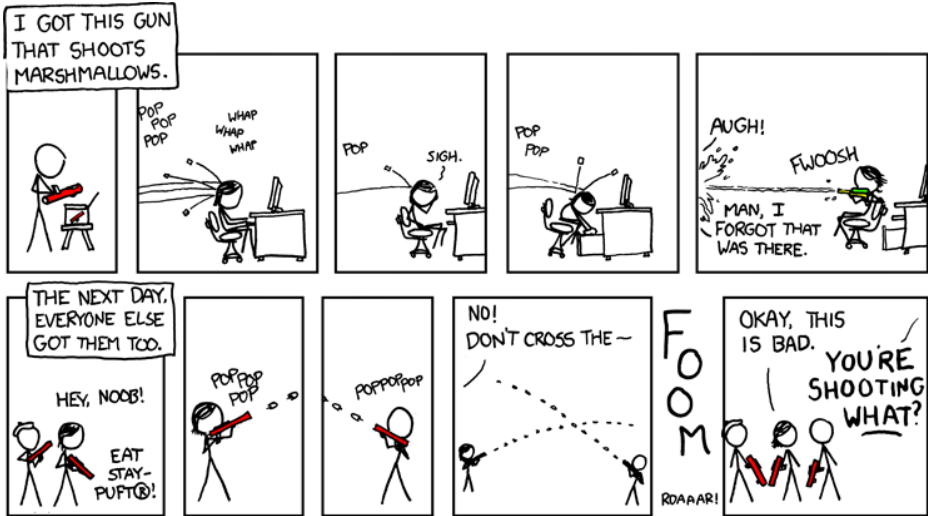
Cueball has tried to play an elaborate hoax on a woman (Hairbun) involving wood chips that match the composition of the wood used to build a 19th-century ghost ship called the Mary Celeste. Unfortunately, Hairbun has done the sensible, reasonable thing and thrown them out instead of checking to see if they belong to a ghost ship, whose wood chips or what-have-you would probably not have found their way to the hallway. This causes Cueball to realize that he needs to rethink the complicated way in which he creates hoaxes, because the people he is trying to trick do not follow through with his elaborate plans.

The title text suggests that he also set up some kind of chemical match with the Shroud of Turin. The Shroud of Turin is a famous artifact bearing a ghostly image of a man's face, said by some to have been used to wrap the body of Jesus of Nazareth.

In 1988, radiocarbon dating determined the shroud's linen was produced between 1260 and 1390. While some defenders of the shroud's authenticity have raised questions about potential contamination or repairs to the original fabric, these theories have been largely refuted by experts. The Catholic Church neither endorses nor rejects the shroud's authenticity.

#517: Marshmallow Gun

December 15, 2008



Except in reality crossing a stream of marshmallows would create a giant Bill Murray.

Explanation

Cueball has obtained a gun that shoots marshmallows and promptly decides to shoot at Megan. Having taken the first few hits without much reaction, she sighs and then brings out her super soaker, which was first used on her in 220: Philosophy (and later reappears in 2334: Slide Trombone), and soaks him with it.

The next day, everyone has such guns and starts shooting marshmallows at each other. We see Beret Guy and Megan who confront Cueball, saying Hey, noob! Eat Stay-Puft®! This is like saying eat lead when threatening someone with a regular gun, since Stay Puft is a fictional brand of marshmallows from the Ghostbusters movie. (Of course, it's also a reasonable thing to say, since marshmallows are edible.[citation needed]) These statements and many like them appear in many first-person shooter games with chat.

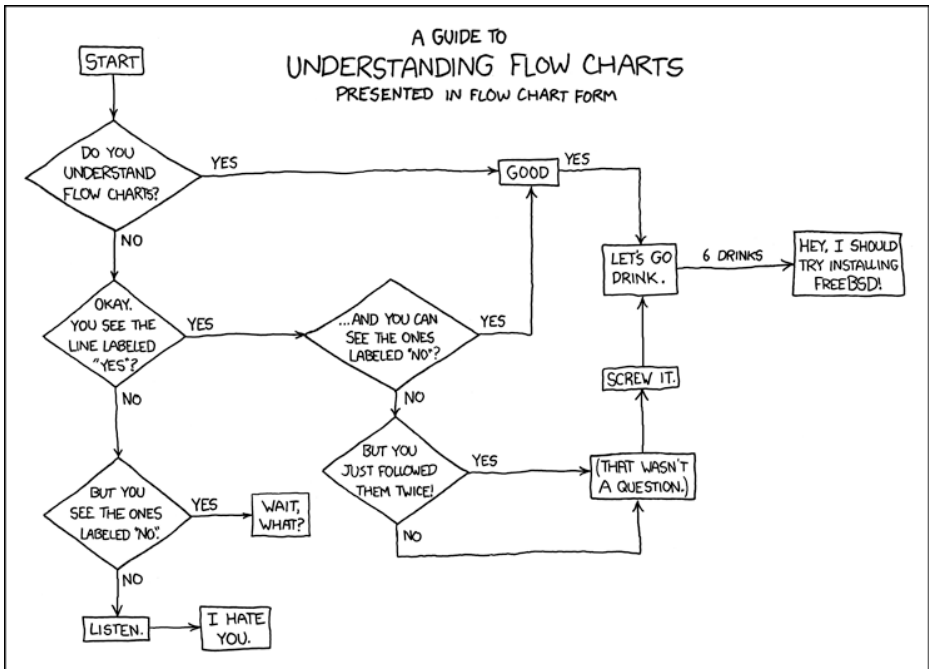
Beret Guy realizes that the "streams" of marshmallows are about to cross and shouts a warning, but it is too late and they cross anyway. This results in something gigantic appearing with a Foom Roaaaar! off-screen. It roars at the three friends. Megan looks up and states that this is bad as the giant shouts You're shooting what? Presumably the crossing marshmallow beams have recreated the Stay Puft Marshmallow Man from Ghostbusters. In the movie, crossing the ghost-capturing streams from the proton packs was "bad." But in the end, in which an ancient spirit took the form of this giant Marshmallow

Man, the monster was destroyed as a side effect of crossing the streams. The Stay-Puft man sees what they are shooting and is justifiably upset.

The title text is a further Ghostbusters reference, as Bill Murray was one of the actors in the movie. Since the crossing of the streams of the proton packs by Bill Murray and the other Ghostbusters is related to the destruction of the Stay Puft Marshmallow Man in the movie, the crossing of the marshmallow streams in the comic does the opposite and summons an enormous Bill Murray.

#518: Flow Charts

December 17, 2008



At 8 drinks, you switch the torrent from FreeBSD to Microsoft Bob. C'mon, it'll be fun!

Explanation

Flowcharts are diagrams that represent processes in a graphical form. While predominantly used in computer programming to visualize the structure of source code, flowcharts can in theory be used to depict any real or virtual procedure. In this comic, this idea is subverted by employing a flowchart to explain how flowcharts work. Flowcharts are a recurring theme on xkcd.

This seems like a faulty basis for explaining anything, but the basic functionality of flowcharts is quite intuitive, and the attempted self-description is almost unnecessary. In fact, the comic does not actually explain how to use the flowchart: it just uses an example of a very simple flowchart to demonstrate to the reader that they can easily work out how to follow it. If the reader attempts to "game" the system by either giving contradictory answers, or refusing to acknowledge that they can see the "Yes" and "No" labels, the flowchart gets confused or becomes abusive. Just like a real computer.

If you confirm or demonstrate that you can follow the flowchart, it inevitably leads to the "Let's go drink" box, which gives rise to the assumption that the whole chart was only a pretense for drinking.

FreeBSD is a unixoid operating system for computers that is generally considered to require advanced skills. The question whether GNU/Linux or (Free)BSD is the preferable operating system is a question of almost

religious belief to some. The comic takes a shot against FreeBSD by implying that one would only decide to install it when under the influence of alcohol. This may also be a reference to 349: Success.

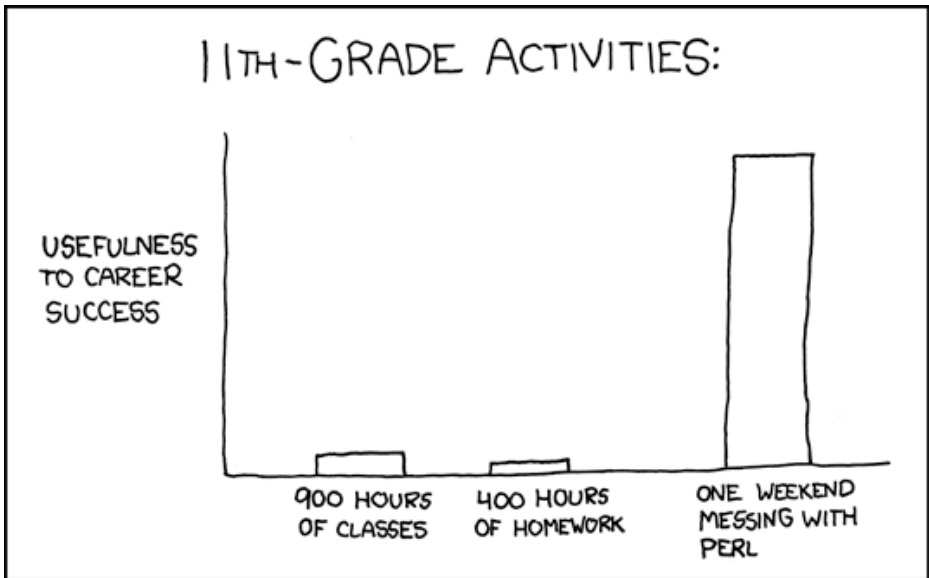
The title text mentions Microsoft Bob, a software package published in 1995 by Microsoft. The product was targeted towards beginners, and Microsoft decided to use a cartoon-style interface instead of a more 'professional' environment. It was a commercial failure, and still serves as an inside joke among IT professionals.

"Torrent" refers to BitTorrent, a peer-to-peer filesharing protocol that is often used to share large files, such as the files for an operating system, via the internet. BitTorrent allows users to, rather than downloading whole files from a central server, download small pieces from each of many "peers" who are downloading the same file concurrently. In the title-text, the reader initially torrents the FreeBSD operating system in order to install it. The reference to "switching the torrent" suggests that if you were even more drunk than you would need to be to download FreeBSD, you would start downloading Microsoft Bob instead.

In xkcd: volume 0, there is an extra step, from installing FreeBSD to "more drinking".

#519: 11th Grade

December 19, 2008



And the ten minutes striking up a conversation with that strange kid in homeroom sometimes matters more than every other part of high school combined.

Explanation

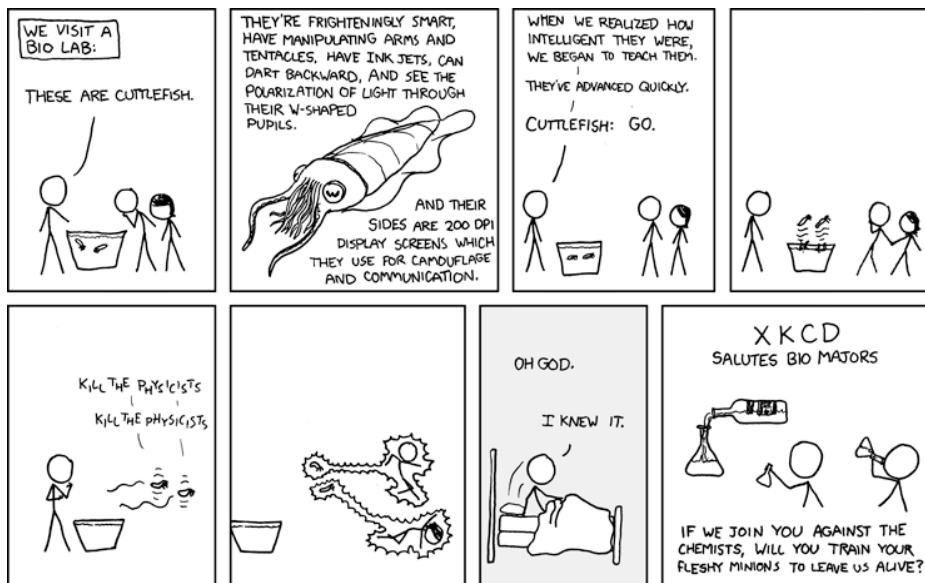
This strip is a comparison about the time spent in 11th grade doing various things, and how important those things are to one's future. The first two bars on the chart are 900 hours of class, which is about 180 hours short of how many hours kids spend in school each year (most likely to show the lunch hour), and 400 hours of homework, or an average of about 2.2 hours per school day. Conversely, idly messing around in Perl (a programming language) for only one weekend is shown to have a much larger impact on one's future — specifically Randall's, as learning how to code would have been key to his job as a robotics engineer at NASA. This is likely due to the skills one can pick up in even just a single weekend in contrast to the often redundant, trivial, or generalist information that schools tend to convey.

This is mainly a critique to how school subjects can be rather useless for one's future or that the school is so boring that students are discouraged to pay attention in class.

The title text continues this sentiment; the fact that the subject of the conversation is left shrouded in mystery deepens the romance (in all senses of the word).

#520: Cuttlefish

December 22, 2008



Unless the CS students finish the robot revolution before you finish the cephalopod one.

Explanation

It appears that Cueball and Megan are physicists visiting a biology lab. Their guide, a biologist looking like Cueball, gives them a description of the humble cuttlefish that is both accurate and makes them sound like other-worldly creatures with highly advanced capabilities.

The scene takes an unusual turn when the scientist implies that the cuttlefish have been easily trained to improve their capabilities. He then demonstrates this by giving a simple command, whereupon the cuttlefish rise out of the water, only to attack and kill both Cueball and Megan, demonstrating an ability to fly, talk, and discharge lethal electric shocks in the process. (See also 35: Sheep).

This is all revealed to be a dream, but it has given Cueball a warning not to underestimate the biologists. Apparently, they can be just as crazy and dangerous as any other kind of scientist. Cueball (who represents Randall, as it is xkcd that salutes in the final panel) offers a toast to all biologists everywhere and plans an alliance with them against the chemists, hoping to prevent further attacks on physicists. He is then shown drinking from a laboratory flask, something that any scientist would be wary of.

In the past, Randall has been somewhat dismissive of the non-math/non-physics scientific disciplines, so this

comic may be trying to mend some bridges with biologists. But not with chemists.

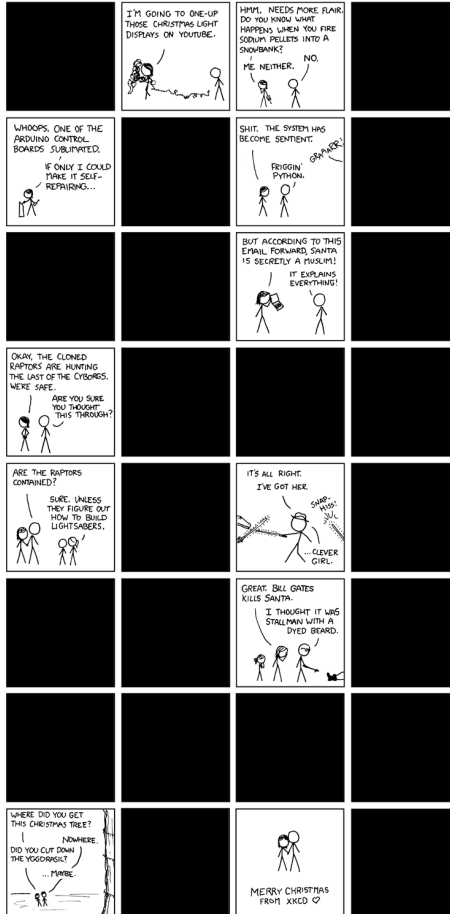
In the title text, CS stands for Computer Science. The "robot revolution" references events in film and literature, wherein robots, having become commonplace in the workforce, achieve independent thought and declare war on humanity, like in *The Terminator*, *The Matrix*, or the movie *I, Robot*. Randall implies that the physicists will switch sides if the robot revolution arrives first. Cephalopod is the class of animals that encompasses cuttlefish, as well as squids and octopodes.

#521: 2008 Christmas Special

December 24, 2008

THE 2008 XKCD
CHRISTMAS SPECIAL

DUE TO THE SLOWING ECONOMY, WE COULD ONLY AFFORD TO PRODUCE THE PRIME-NUMBERED PANELS. YOU SHOULD BE ABLE TO INFER THE MISSING PARTS OF THE STORY EASILY ENOUGH. WE APOLOGIZE FOR THE INCONVENIENCE.



'How could you possibly think typing 'import skynet' was a good idea?'

Explanation

This comic is the xkcd Christmas Special from the year 2008. The prologue states that due to the 2008 financial crisis, only very few images of the strip could be produced. This leaves the others to be blacked out. It is therefore left to the reader to reconstruct the whole story based on the given images. While it is claimed that the reconstruction should be rather easy, the complicated and abstruse plot-line makes it nearly impossible to fill the gaps. Any attempt at inferring the missing images would therefore be largely guesswork. The comic features the well-known xkcd characters getting involved in a strange fight with cyborgs and raptors on Christmas Eve.

The line "We apologize for the inconvenience." is possibly a reference to the famous book series *The Hitchhiker's Guide To The Galaxy* by Douglas Adams. It appears there as God's Final Message to His Creation, written in letters of fire on the side of the Quentulus Quazgar Mountains.

Panel 2: Megan strives to outdo some Christmas lights she has seen on YouTube.

Panel 3: Dissatisfied with her work, Megan is thinking about alternative ways to improve her light arrangement. The idea of firing Sodium pellets into snow is probably a bad one, as Sodium reacts exothermically with water and may, in large amounts, induce explosions.

Panel 5: Probably still obsessed with creating a large and impressive light display, Megan has constructed an electronic device with an Arduino processor, perhaps to make the light chain show patterns. However, the energy she used was too high. This causes one of the control boards to sublime, i.e. go directly from a solid to a gaseous state without an intermediate liquid phase. She then wishes she could make the system self-repairing.

Panel 7: Megan's device has developed artificial intelligence, allowing it to feel. This is presumably a result of Megan attempting to make the device self-repairing. This common trope in science-fiction works usually leads to the system's attempt to eradicate its creator. Cueball attributes the emergence of a personality to the awesome ease and power of programming in Python.

Panel 11: Out of context, this panel introduces the idea of Santa Claus being a Muslim. This may be a reference to the persistent Internet rumours that Barack Obama is a Muslim, though he declares himself to be a Christian. However, the statement could also relate to the fact that Santa Claus is usually displayed with a large beard, which is sometimes also sported by conservative Muslims. Or it could just be nonsensical.

Panel 13: At this point, the self-aware Christmas light control systems have released cyborgs that tried to kill Megan and Cueball. To repel the cyborgs, they have cloned Velociraptors. Cueball expresses doubt about whether that was a good idea. Velociraptors appear

frequently in xkcd, as seen in these comics

Panel 17: As predicted, the raptors have gone wild, but Megan, Cueball and the two smaller characters (perhaps their children) managed to cage the dinosaurs. They believe themselves safe unless the raptors learn how to build lightsabers. This is a reference to a line in Jurassic Park where the main characters believe themselves safe until they discover the raptors can learn how to open doors.

Panel 19: The raptors have indeed succeeded with constructing lightsabers and must now be fought. The "Clever girl" refers to a line from Jurassic Park where the raptors outflank (and kill) one of the human characters wearing a similar hat. "Snap-hiss" is a common phrase originated by Timothy Zahn to describe the sound of a lightsaber igniting in Star Wars literature.

Panel 23: IT billionaire Bill Gates has mistakenly killed Santa Claus, possibly in a sword fight. He claims to have mistaken him for Richard Stallman, a prominent free software activist. (Gates strongly opposes the idea of free software and is therefore considered an antagonist by many of its supporters.) The most striking resemblance between Stallman and Santa Claus is probably the long and untamed beard. 225: Open Source features Stallman involved in a sword fight. Much later, Randall again killed off Santa in his Christmas comics, and did so twice in only three years. First in 2559: December 25th Launch, from 2021, and then again in 2023's 2872: Hydrothermal Vents.

Panel 29: Black Hat is asked by Megan (or possibly his companion, Danish) where he obtained the enormously large Christmas tree that can be seen on the right side of the zoomed out picture. It is implied that he felled Yggdrasil, the giant ash tree of Norse mythology. According to tradition, Yggdrasil is the world tree representing the whole of creation and holding together the cosmological structure.

Panel 31: Randall wishes Merry Christmas to all xkcd readers.

The title text refers to panel 7. In Python, modules are imported using the "import module" syntax. Skynet is a self-aware artificial intelligence system featured in the Terminator film series as the main influence behind most of the antagonists. Importing the Skynet module might therefore account for Megan's system's developing an evil personality.

There is an actual pip module named "skynet"; however, unlike antigravity in 353: Python, it seems to not be specifically referencing this comic, having been created almost eight years later. The module's description says that it "demonstrates the usage of Python's exit-hook, exception hook and signals handling", by using them to prevent the user from exiting Python "to the best of its ability" when the module is imported (somewhat in line with the whole idea of a rogue computer), and cautions you to try this at your own risk.

Note that this comic was first published in another

version that had panel 29 as panel 27 and the "Merry Christmas from xkcd" message at the bottom. As 27 is not a prime number, the current version was published in place of the erroneous one.

It has been observed that the top left nine panels have the configuration of a Glider in Conway's Game of Life. The glider is sometimes used as an emblem representing hacker subculture, although rotated by 90 degrees. However, it remains unclear whether the occurrence in the comic is intentional or an incidental side-effect of the prime number pattern in use. If you put the shown comic panels in The Game of Life, it turns into a Beehive, for reasons also probably not deliberate, unlike a later comic's explicit invocation of this mechanism. The last fourteen black panels also coincidentally form the shape of a crewmate from the game Among Us, although the comic predates the game by a whole decade.

#522: Google Trends

December 26, 2008

BLOGGERS WERE RECENTLY AMUSED TO DISCOVER THAT, ACCORDING TO GOOGLE TRENDS, THE SEARCH TERM "MEN KISSING" IS MOST POPULAR IN CONSERVATIVE UTAH.

A FEW OTHER EMBARRASSING CORRELATIONS:

<u>SEARCH TERM</u>	<u>TOP CITY</u>
INSTALLING UBUNTU	REDMOND, WA
RUNNING FOR PRESIDENT IN 2010	WASILLA, AK
LINCOLN FAN FICTION	CHICAGO, IL
RAPTORS ON HOVERBOARDS	SOMERVILLE, MA
HOW IS BABBY FORMED?	WASILLA, AK
I HATE THIS WEBSITE	MOUNTAIN VIEW, CA

Obama has been writing Lincoln/Obama erotic fan fiction on his secret live journal. Excerpt: Lincoln lay back on the bed, nude save for his trademark stovepipe hat. 'Tell me,' he purred seductively, as he and Obama formed a more perfect union. 'When you come, is it 10% ethanol?'

Explanation

Google keeps track of which searches are most popular in which regions as part of more general data mining to improve their service. For the enjoyment/education of others, they release select, non-personal parts of this data under the banner "Google Trends."

The first statistic – that "Men kissing" was popular in Utah, a state known for possessing a large population with very conservative social values, including opposition to homosexuality – is real.[actual citation needed] The others are made up for the sake of the joke. In order:

- "Installing Ubuntu" – Redmond, WA: Ubuntu is a Linux distribution; Redmond, Washington is home to Microsoft, the company that makes the rival operating system Windows.
- "Running for President in 2010" – Wasilla, AK: 2010 was not a presidential election year in the United States; Wasilla, Alaska is home to Sarah Palin, a politician known for making such gaffes and who was John McCain's running mate in the 2008 election that occurred a few weeks before this comic.
- "Lincoln Fan Fiction" – Chicago, IL: Abraham Lincoln was the US president from 1861 to his assassination in 1865; Chicago, Illinois is home to Barack Obama, who apparently reads (presumably erotic) fanfiction about the former president.
- "Raptors on Hoverboards" – Somerville, MA:

Velociraptors are a favorite xkcd topic; there are also frequently references to Back to the Future as with the hoverboards here. Somerville, Massachusetts is home to Randall Munroe. The speed of a Raptor on Hoverboard is given in 526: Converting to Metric.

- "How is babby formed" – Wasilla, AK: "How is babby formed?" was the title (and most of the content) of an infamous Yahoo! Answers question (see the title text of 481: Listen to Yourself and 550: Density). Wasilla, Alaska is, again, home to Sarah Palin; a few months prior to this comic's release, Sarah Palin revealed that her daughter, Bristol Palin, was pregnant out of wedlock. Ironically, before her pregnancy, Bristol Palin advocated sexual abstinence before marriage as well as banning sex education in schools.[actual citation needed] Ignorance of common contraceptives like condoms can cause unplanned pregnancies to happen.
- "I hate this website" – Mountain View, CA: Mountain View, California is home to Google's headquarters. The implication is that Google employees are putting "I hate this website" into Google.

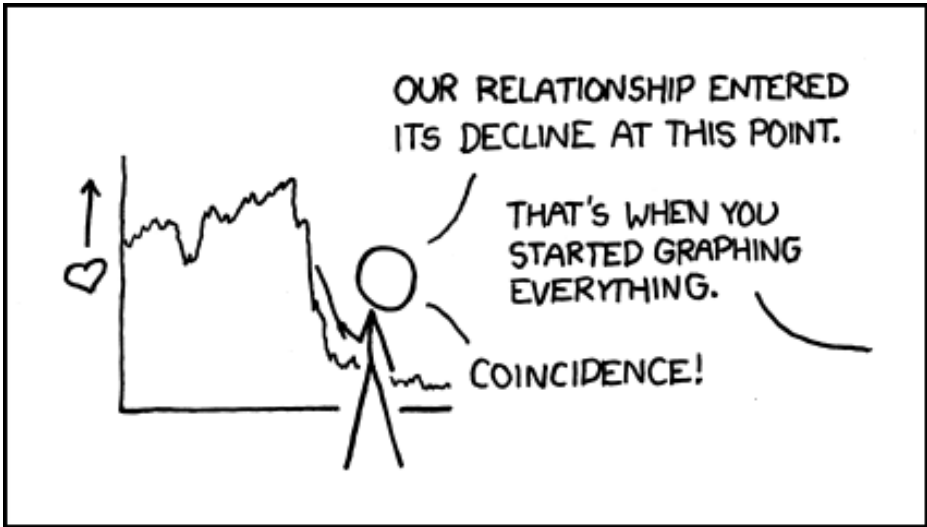
With regards to the excerpt Randall provides in the title text:

- Slash fiction is a genre of fan fiction that focuses on homosexual behavior.
- Lincoln/Obama (pronounced Lincoln slash Obama) fan fiction normally should be between Abraham Lincoln and Barack Obama.

- The "more perfect union" line comes from the preamble to the US Constitution: "We the People of the United States, in Order to form a more perfect Union...". However, it seems to have a sexual connotation in this case.
- Come (sometimes spelled cum) might be a reference to Obama orgasming and/or ejaculating.
- Ethanol is the more scientific name for drinking alcohol, or simply alcohol.
- "10% ethanol" refers to automotive gasoline that includes 10% ethanol (usually made from corn or other vegetables), with the hopes of reducing the dependence on oil for fuel. The Obama administration adopted a policy in 2013 that mandated ethanol to make up 10% of the US's fuel supply.

#523: Decline

December 29, 2008



'There's also a spike on the Fourier transform at the one-month mark where --' 'You want to stop talking right now.'

Explanation

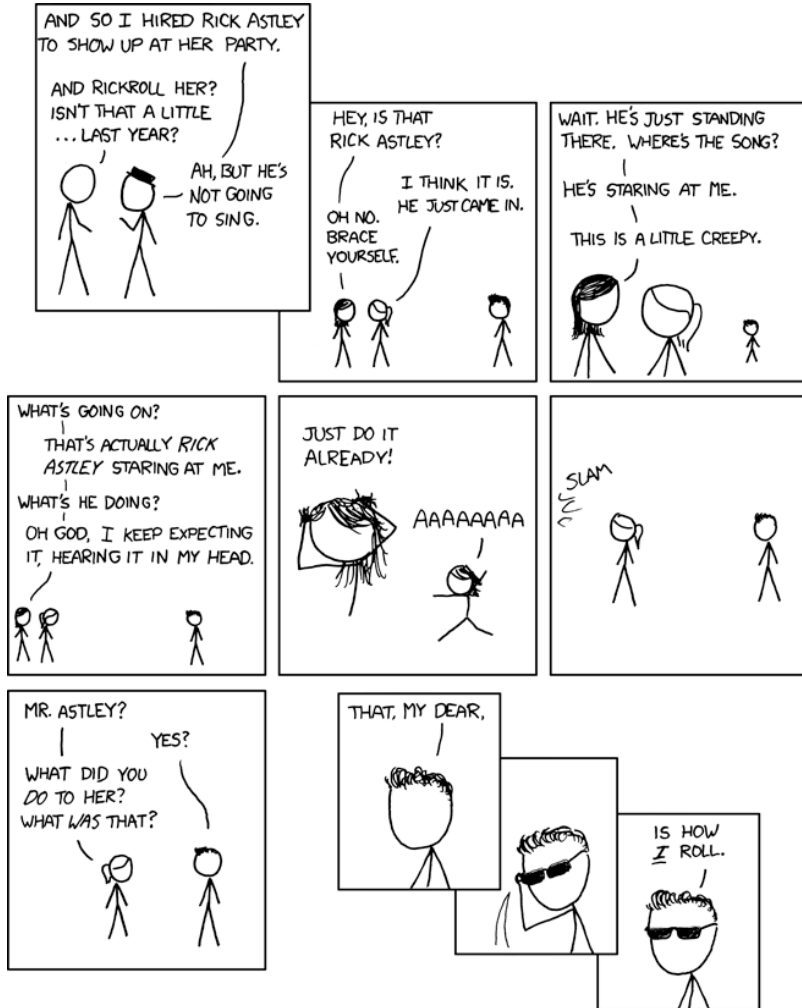
Cueball, apparently concerned about the status of his romantic relationship, has constructed a "relationship graph" plotting an ambiguously quantitative metric for love and/or affection against what is presumably time (the x-axis is not actually labeled; ironically in 833: Convincing Cueball states that not labeling graph axes is a relationship deal-breaker). He has identified a sudden drop. Cueball's romantic partner (probably Megan) notes from off screen that the drop corresponds to the moment Cueball's obsession with graphs began. He claims that the two events are coincidental, thereby referencing the recurring xkcd theme of correlation not necessarily implying causation – see 552: Correlation.

The title text references Fourier transformation. The Fourier transform is a technique for discovering the periodic characteristic(s) of a function. A spike at one month on the Fourier transform of the love graph would mean that something happens every month that causes the relationship to change. This is presumably a reference to Megan menstruating, although this isn't proven. This is not something you should mention to your girlfriend, and she asks him to stop talking before he finishes the sentence. After this graph, the relationship may very well end....

Fourier transformations were mentioned previously in 26: Fourier.

#524: Party

December 31, 2008



I wonder what 2008 meme will go bizarrely mainstream in 2009 like Rickrolling did 2007-2008. I Accidentally <noun>? Yo dawg? Place your bets now!

Explanation

This New Year comic plays out at what is, probably, a New Year party thrown by Danish. (The previous New Year day comic in 2007 was also related to a wild party: 364: Responsible Behavior).

In the first panel, we see Black Hat telling Cueball that he has hired Rick Astley to show up at a party for a girl. Cueball, assuming Rick Astley is going to perform a live Rickroll, asks if it isn't a little "last year".

Rickrolling is where one is redirected to a video of Rick Astley singing "Never Gonna Give You Up" via a weblink purporting to be something else. It was later extended to any situation where the song is used disruptively, such as during a party. It started in 2006 and grew until peaking on April Fool's Day in 2008. Thus, at New Years Eve 2008, the meme was getting old.[citation needed] However, Black Hat assures Cueball that Rick Astley is not actually going to sing.

The comic then continues to the now ongoing party and we see the girl in question, Danish, Black Hat's girlfriend, talking with Ponytail when she notices Rick Astley at her party. Like Cueball, Danish expects that Rick Astley is going to sing and Rickroll her. She obviously hates this idea and braces herself for the humiliation of being Rickrolled, but she is freaked out when he just stands there staring at her without singing. In the end, his presence alone causes her to hear the song in her head instead, and finally she flees the room screaming,

slamming a door behind her. Black Hat has essentially Rickrolled her in her own mind, which is far worse than just playing a song for her, but Black Hat could not have done so without the willing assistance from Rick![citation needed]

When Ponytail asks Rick Astley "what did you do to her?", he begins by saying "that, my dear" and then slowly puts on sunglasses before he answers "Is how I roll." This references both Rickrolling and the "that's how I roll" meme.

Although the identity of the girl Black Hat is pranking is not stated by Randall (he refers to her as Girl 1), there is a theory that she is Danish, Black Hat's girlfriend. However, Danish would likely ordinarily play it cool and be entirely unruffled by something like this. Most agree that this behaviour is more akin to Megan, as she can assume all sorts of various reactions to stimuli depending on what Randall decides is appropriate in that instance.

The title text refers to the fact that Rickrolling first appeared in 2007 (on 4chan) and became viral for over a year. Given that this is a New Year comic, it is thus relevant to ask what meme will replace Rickrolling in the new year, 2009. Although Randall makes reference to the "Xzibit Yo Dawg" and "I accidentally..." photocaptioning memes, memebase entries suggest the "Keep Calm and Carry On" meme may well have become the most popular (and most enduring, as of 2013) meme of 2009.

Rickrolling became one of the most relevant memes from

that era. There are many articles on why that is.

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